REVISED EDITION *ELEVENTH THOUSAND*

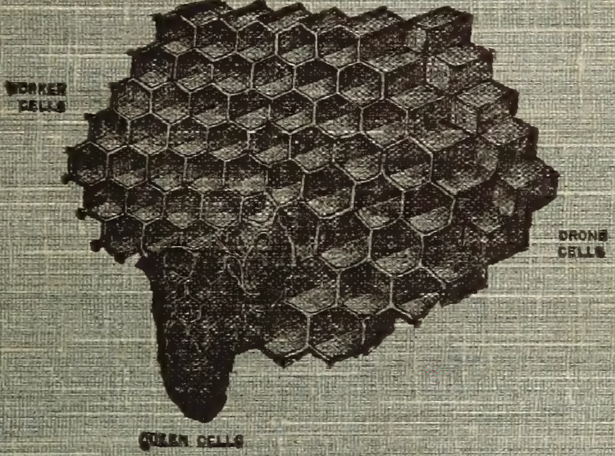
1914  1914

QUEEN

A

MODERN BEE FARM

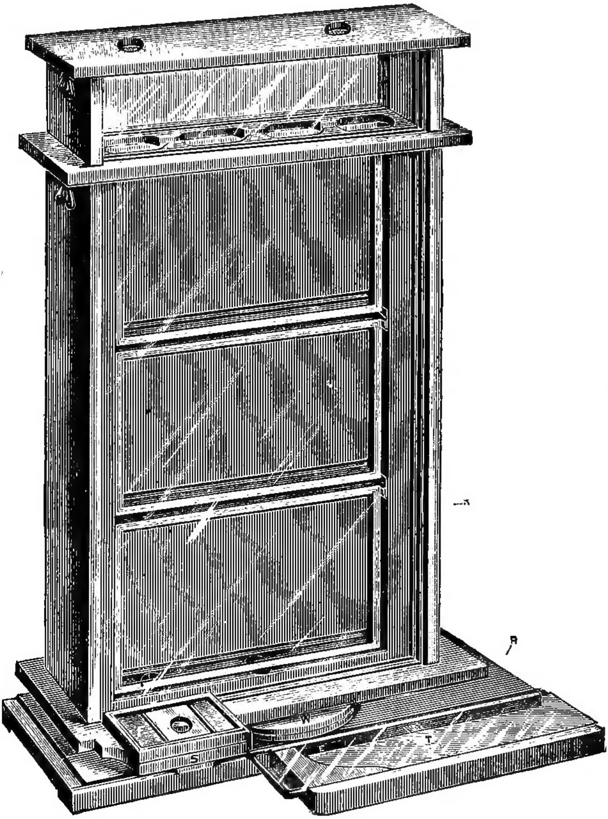
S. SIMMINS



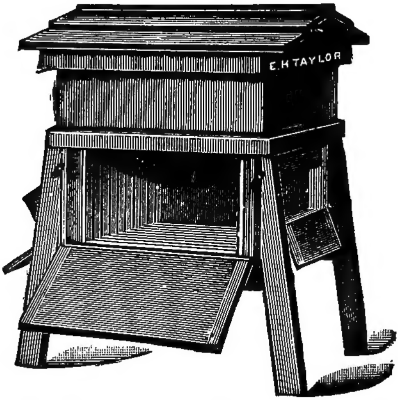
WORKER

5/-

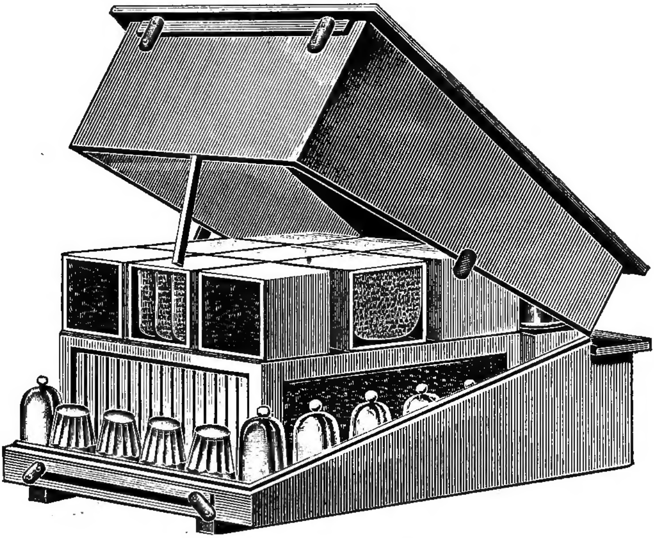
DRONE



Messrs. Lee & Son's
Royal First Prize Observatory Hive.



MR. E. H. TAYLOR'S SEMI-OBSERVATORY HIVE,
WITH FULL COMPLEMENT OF FRAMES.



SEMI-OBSERVATORY HIVE.
A FINE ILLUSTRATION OF THE EARLY METHODS OF SECURING COMB HONEY FROM BAR-FRAME HIVES.
FROM THE REV. L. L. LANGSTROTH'S BOOK.

BRITISH APPRECIATION.

Press Commendations.

British Bee Journal.—"This is a useful book for those intending to cultivate bees, more particularly for such as intend to make it a business."

Live Stock Journal.—"Other journals must deal with this very intelligently written book from its other sides. . . . We never saw a bee-book which seemed better worth buying by those who wished to keep bees."

Bee-Keepers' Record.—"We have perused this book with a considerable amount of interest, mainly from the fact of its being the first attempt on the part of a *really* experienced man in the United Kingdom to face the problem, 'Will a bee-farm pay?' . . . We cordially recommend the new bee-book."

Most Practical in Three Languages.

"I have been reading every book (in English, French and German) on Apiculture, and of all the works that I have studied (especially as regards practical information) I much prefer your 'Modern Bee-Farm,' the style of which is so charming." CLEMENT COKE.

Worth £5 a Copy.

"My son and I are agreed that 'A Modern Bee-Farm' is worth its weight in gold! I should certainly be sorry to take £5 for the copy I have received from home, if I knew it were impossible to obtain another; ———, ———, ———, and some half-a-dozen others who have sought to teach us our business can in future rest on the shelves."

Knysna, Cape of Good Hope. S. DEACON.

Hundreds Repeat These Words.

"Your 'Modern Bee-Farm' is worth all other books on bees put together." H. S. CHAPMAN.

Sandon, Frodsham.

From the Hands of a Master.

"I have read 'A Modern Bee-Farm' with,—well, where shall I find a word that can convey my feelings?—'pleasure' is a shadow. It is a work from the hands of a master of Apiculture."

Brechin, N.B. BENJAMIN BERNE.

Not a Dream, but Verified Fact.

An experienced bee-keeper of many years' standing writes (July, 1909):—"I had heard of your system for years, but always thought of it as an 'enthusiast's dream,' until the other day I visited an apiary and saw the Conqueror Hives filled to *over-flowing* with bees (from your queens); then at a glance could see that for the production of honey, for ease with which the brood chamber could be examined when supers are on, etc., your system is A1."

£10 for 5s. 4d.

"I would gladly have given £10 to have had it a year ago, as it would have saved me far more than that in experiments." H.L.

Var Trees, Dorchester.

"A Modern Bee-Farm" different to all others.

"I never was so pleased with a book in my life; shall recommend it to my bee-keeping friends." T.C.

Letchworth, Herts.

AMERICAN AND OTHER OPINION.

American Bee Journal.—"It covers the whole field of Apiculture, and is written in a terse and interesting manner."

Gleanings in Bee Culture (1888 edition).—"The work is beautifully printed on a fine quality of paper. In plan it is excellent; each subject and its sub-head being distinctly separated by strong black head-lines, so that a novice can easily find such information as may be desired."

Editor of *Gleanings* (1904 edition).—"This is a work of no ordinary merit, and reads like a novel. One of the best bee books."

Mr. Frank Benton,

of the United States Department of Agriculture, Washington, writes:

"The new book came to hand this morning. It is now midnight, and I have spent the whole day with it. You have indeed done well what few accomplish at all—made a book which is full of interest to every enthusiastic bee-master; yet for the beginner a simple, pointed guide to success. . . . Since Langstroth's book, nothing, except Cheshire's magnificent work, compares in interest or value to this."

"Good Stuff, Indeed!"

"I have just finished reviewing a copy of the 1904 edition of 'Modern Bee-Farm." Good stuff, indeed! I am truly glad to see that you are not bound down by the old dogmas of bee-keeping. We have nothing which shows the results of careful experiments as yours does."

Clark University, BURTON U. GATES.
Worcester, Mass.

An American Specialist,

of Knox, Starke Co., Indiana, U.S.A., says:—

"A few months ago I bought your book. I have read the same three times from cover to cover, and the chapter about Foul Brood about ten times. It is the best book, and I have a good number of books about bees, as I am a specialist." F. W. LUEBECK.

"The Bee-Wizard,"

of Lincoln, Nebraska, U.S.A., writing May 8th, 1911, *says:*

"Amongst the most prized and most often reviewed volumes in my library is your 'Modern Bee-Farm,' and I have long thought of sending you this word of personal commendation and thanks."

FRANK G. ODELL.

A New Zealand Bee-Keeper,

Writing from Timaru, says: "I have read 'A Modern Bee-Farm' through with much pleasure and profit. I think, without exaggeration it is the best of all my bee-books, and I have a good many."

JOHN YOUNG.

"A Modern Bee-Farm" Well in Front.

"I find your 'Modern Bee-Farm' full of useful information. I see methods that you advocated twenty years ago are being brought to the front here as something new." DAVID F. DOW,
Ipswich, Mass. Landscape Architect.

Printed by
Hepworth and Company, Limited,
Tunbridge Wells,
And 165, Queen Victoria St.,
London, E C.

A MODERN BEE-FARM

AND ITS ECONOMIC MANAGEMENT.

SHOWING HOW BEES MAY BE CULTIVATED AS A MEANS OF LIVELIHOOD;
AS A HEALTH-GIVING PURSUIT;
AND AS A SOURCE OF RECREATION TO THE BUSY MAN.

PROFITS MADE CERTAIN BY GROWING CROPS YIELDING THE MOST HONEY,
HAVING ALSO OTHER USES; AND BY
JUDGMENT IN BREEDING A GOOD WORKING STRAIN OF BEES.

NEW AND IMPORTANT INFORMATION RELATING TO THE TREATMENT
AND CURE OF

BEE-PARALYSIS, OR THE ISLE OF WIGHT DISEASE,
INCLUDING THE AUTHOR'S DEFINITE LAW FOR ENSURING
THE DECLINE OF THAT MALADY.

Includes a Treatise on

HONEY: ITS USES IN HEALTH AND DISEASE;
WITH NOTES ON GENERAL HEALTH.

ALSO NOTES UPON

PROFITABLE GRASS-FARMING AND DAIRYING
AND ORCHARD PLANTING

AS SUITABLE AUXILIARY OCCUPATIONS FOR THE BEE-KEEPER.

BY

S. SIMMINS,

Author of "Direct Introduction of Queens," "Simmins' Non-Swarming System," &c., &c.

HEATHFIELD, SUSSEX: PUBLISHED BY THE AUTHOR.

MAY, 1914.

Editions of this Work:

1888, 1893, 1904, 1914.

DIRECT INTRODUCTION, 1882.

SIMMINS' NON-SWARMING SYSTEM, 1886.

SIMMINS' NEW QUEEN REARING, 1894.

PLUMPING; OR RAPID INCREASE IN SPRING, 1894.

PREFACE.

WITH few exceptions, the instructions contained herein will be confined to the Author's own practical experience, which has extended over more than forty years of close observation.* The reader will therefore have the benefit of a lengthened and varied experience, and by following a recognized system, there will be little possibility of the novice being confused by the usual multiplicity of ideas upon any one subject. When the beginner has mastered the present system he will then be in a position to use his own judgment in selecting the good and leaving out the errors of others.

The Author does not hesitate to say that he has himself learned more by his failures than by success, in that where he has failed there has been a direct incentive to overcome such difficulty; and as the result, some of the most important methods of management have been brought about, while time and labour-saving implements have been devised; all of which will be found invaluable to the Apiarist of the present day.

It has been the Author's utmost endeavor to place the management of Bees before the novice in as clear and straightforward a manner as possible. He knows full well how difficult it is for one more advanced in the science to fully expose every detail of procedure, and how equally difficult it is for those just entering the ranks to grasp many of the details which go to make up the grand total of success; hence the reason why some apparently simple

* Any reader desiring to study the complete anatomy and physiology of the hive bee should secure the works of Cheshire or Cowan.

matters are gone into at length, that the learner may profit by the writer's own earlier experiences—in some cases, costly experiments and failures.

With regard to the foregoing it is hoped that those who are more advanced will not be wearied by that which is given for the benefit of others who have not much knowledge of the subject, remembering that we all have been in need of just such teaching. At the same time, the Author trusts the expert will find some things not before known to the bee-world, and which he will be willing to admit go far towards the economic production of honey; and, moreover, constitute the very "pith" of practical bee-keeping.

It will be asked: "What are the profits of Bee-keeping?" Many consider that there is a fortune in it, but this is not so. All may gain health and pleasure in following the study of this, the most remarkable creature in the insect world, but the number who make a profit out of this occupation will be limited to those only who have special qualifications, and are able to give the subject close study and application.

The man who finds himself adapted to the undertaking may safely invest his money, and be assured of obtaining, to say the least, better returns than very many other occupations offer at the present day.

And now a word as to other subjects—other kindred occupations that the bee-keeper may follow to advantage. I hold out no hopes that bee-keeping alone will support a family, at least in this country. Many young people who fail at office work, or in other occupations, turn to poultry, to bees; or it may be fruit or other farming; and in the following pages I endeavor to show how a reasonable profit may be secured from a few acres of grass land by making the most of everything that can be worked upon

it, so that one branch of agriculture may help another; while on the other hand, if the season is unfavorable for one item, it is often even more suitable for some other of the several occupations carried out upon the farm of moderate dimensions.

Among the small-holders starting in increasing numbers about the country there are many who are persuaded to take to bee-keeping, without knowing anything of practical management, and what is worse, do not know bee-diseases in any form. These and others taking up the subject in a careless manner, are the greatest source of danger to the general community of practical bee-keepers, and it is time an Act was passed which should restrict these and other dangers that may otherwise seriously affect the industry because of such carelessness.

GENERAL INTRODUCTION.

THE Culture of Bees is one of the most healthful occupations that can be named, and at the present day it is being adopted as a business, while the number of people in all ranks of life who keep only a few hives as a pleasant pastime is very large, as may be judged from the fact that the members of the various associations in this country make up a total of many thousands.

Honey, the matchless gift of Nature, has become much cheaper than it was when the supply was very limited; but while an increased production lowered the value, there is at the same time a larger and increasing demand for the bee-keeper's commodity; and as he now has the benefit of improved appliances there is no difficulty in competing with present rates, which, however, should now improve, as all other commodities are rising in price.

There is as yet much to be desired in methods of management among the majority of bee-owners, as will be evident by a perusal of these pages.

When honey was superseded by sugar, bee-keeping seems to have fallen into the background, but after a time light began to dawn, and some forty years since, by using hives wherein all the combs could be removed separately at will, a great stimulus was given to both practical and scientific bee-keeping; consequently, the ranks began to swell, as it became known that much larger harvests could be secured than by the old fixed-comb methods, and in every way the bees could be brought more under control.

But more light was yet needed, and Bee Journals were established, but it was not until the year 1873 that this country could boast of one, and that was founded by

Mr. C. N. Abbott, of Southall, as a monthly, and who ably conducted it for about ten years, when it passed into the hands of the Rev. H. R. Peel. In May, 1883, the *British Bee Journal* was issued fortnightly; in August, 1885, Mr. T. W. Cowan became editor and proprietor, finally issuing it as a weekly in Jan., 1886. Soon after the above journal was established we find Mr. Abbott inaugurating the British Bee-Keepers' Association, his object being the diffusion of the knowledge of bee-keeping, especially among the poorer classes, as a means of bettering their condition.

In 1874 this body held its first great Exhibition of Bees, Hives, and Honey at the Crystal Palace; and since that time other Associations have sprung up, one after the other, each holding its own Annual Show. Is it any wonder then that thousands more have become acquainted with the value of the busy bees' product?

The manufacture of hives and appliances has become quite an industry, giving employment to many; but it is generally carried on in connection with the making of foundation, as well as with some other, or all of the several, branches of apiary work.

Honey in the comb will ever remain a luxury, but that in the liquid form should be found in every household, besides being used in various manufactures; and the apiarist should do his best to place the latter upon the market in as cheap a form as possible, at the same time being careful that such shall have a neat and attractive appearance.

Among the early pioneers of movable comb-hives, may be mentioned Mr. Woodbury in England; the Rev. L. L. Langstroth, in America, and Dr. Dzierzon, in Germany; and though the latter cannot be said to have used movable frames, he nevertheless adopted movable top bars, which of

course could only be withdrawn after the comb attachments were separated from the walls of the hive.

It is possible that M. Francis Huber, the eminent blind bee-keeper, used the first movable frame hives for purposes of observation.

INTRODUCTION TO REVISED EDITION.

It should be understood that small (less than 1lb.) packages for honey find little favor in general commerce. In every direction we see that prices are ruling lower than they were some few years since; and the consequence is that larger receptacles are required, so that jams and similar articles may be supplied to the public at a minimum of cost. Nevertheless, prices generally reached their lowest level prior to 1910, and the honey-producer should now expect better rates for his produce.

While there is now an unlimited demand for honey, the prices obtainable will vary, according to the energy displayed by the individual bee-keeper. If he is his own salesman and will use some of the methods given herein for creating a demand, or some novel plan of his own, his returns will be considerably in excess of those secured by the less active producer.

For rapid and convenient handling, the retail trade requires some protection for comb honey, but the producer must endeavor to give the best possible effect at the least expense, as he will certainly not be repaid for any great outlay in that direction.

A feature of serious importance to honey producers is the re-introduction of the larger brood frame, much used before the present Association frame came into use; the latter having repeatedly proved too small for the purpose, when its results have been compared with the advantages derived from the other.

My non-swarming system and the working of new section combs expressly for the current season's work, as first set out in my pamphlet of 1886, is herein explained, and illustrated according to latest developments.

The Chapter relating to bees and fruit, seeding crops, etc., has again been considerably extended, showing how largely the growers of such crops must depend upon fertilisation by the honey-bee in particular, for the success of their plans. It is an item which should be largely circulated in the interests of both apiarist and agriculturist; it will certainly result in a better understanding between those engaged in the respective pursuits.

The Chapter on honey and its uses has had some important additions made to it, in showing the practical uses of honey in both chest and throat complaints; in what form to use it, as well as giving such recommendations for other rational treatment in connection therewith, which will seldom fail in affording speedy relief. This

knowledge should be spread broadcast by every bee-keeper who has honey to sell.

The subjects of queen-introduction, queen-rearing, and many others will be found to have undergone careful revision; while in some cases other valuable facts have been added, as the result of a further extended experience.

The treatment of Foul Brood is of such vast importance to bee-keepers generally that I include in my new work the several propositions formerly published by me in another paper (1898-9), in connection with the origin, development, and cure of Foul Brood, both with and without medicine, and without the destruction of valuable combs and other material.

Some of the most important features in connection with the Author's definite and successful treatment of brood disease therein offered have since been confirmed by other writers, who, unfortunately for their own reputation, have claimed the processes as their own.

My method of Direct Introduction, published some 30 years ago, commended at the time by the late Mr. D. A. Jones, of the *Canadian Bee Journal;* by the late Mr. W. B. Carr, in the *Bee-Keeper's Record;* as well as by Mr. Fk. Cheshire, in his magnificent work, and by numerous other practical bee-keepers, has quite recently been claimed by American and other writers as their own idea.

Thus, in addition to original and profitable methods of management in developing immense populations at the right moment, the Author offered, in 1886, the only correct method of clarifying extracted honey in tall cylinders; also in the same year a new method of greatly improving Comb Honey in sections by a simple process of bleaching; the systematic production of new combs in sections before the honey flow occurs, thus nearly doubling the usual yield; and a perfectly cushioned Comb Honey Case for railing (or shipping). In 1894 the Author offered the first separate and removable queen-cell bases, and he herein shows how the cell cups may be constructed without using melted wax. In 1883 he offered percolating, or self-acting feeders, syrup cans and cisterns, for use in out-apiaries, where it is inconvenient to make syrup by cooking.

The Author's methods of working two queens in twin hives or more queens in treble, as well as in storifying hives, as first offered in the 1893 and 1904 editions of the work, are very fully illustrated and described.

The only rational method of improving honey gathering stock by establishing a Pedigree strain by a process of registration, and direct line breeding as regards both drone and queen rearing parents, as conducted for many years by the Author, is here fully exposed for the first time.

Since the issue of the last edition of this work, a disease previously unknown to the majority of British bee-keepers, but quite common in America, started in the Isle of Wight and in Cornwall in the same year (1904), and has swept over the country like some irresistible wave, destroying whole apiaries, and in all, thousands of colonies. The owners, including many first-class experts, taken by surprise, were helpless in the face of the malady, until the Author showed his numerous correspondents how simple a thing it was to deal with by following common-sense methods that aim at raising the vitality of

affected stocks. In addition to Chapter XI., see pages 444-449, and page 454.

Radical change or revolutionary teaching, though proving correct in application, is seldom accepted as an economic principle for at least a decade after its advent. The same may be said of my original principle of advanced hive construction, and prevention of swarming, as finally represented in the Conqueror hive which was illustrated in my 1893 edition and left to work its way upon its own merits.

By referring to the bee-literature of that period, it will be found that neither at home nor abroad was there any mention of a non-swarming hive or system until after the publication of the Author's pamphlet upon the subject in 1886; many copies of which were circulated both here and in America, as well as in the colonies, and other countries.

In the same work was given also my Systems of Controlling Swarming with common hives, such as "Swarming without Increase," and "Combined Swarming and Doubling without Increase"; definite and vital principles laid down in the said pamphlet of 1886, and such as are not even yet realized by the majority of bee-men who are still striving after what has already been given them to see and to use—processes which will enable them to double the strength of their honey colonies.

I may be excused for suggesting that this work will not become out-of-date, when I refer my Readers to the American Bee-Journals, wherein quite recently a number of methods offered by our cousins as new and valuable items in management, were first published by myself in definite form twenty to thirty years ago.

Some of the latest of these adaptations being the Author's 3-side-cut sections, with the whole sheet of foundation placed across three to four sections in a line without other fixing (1887); the only practical method of (uncooked) soft sugar feeding, described as "dry feeding" to distinguish it from syrup feeding (1883); the systematic production of "drawn-combs" for all sections prior to each season (1886); and other items herein enumerated.

The Author holds very moderate views as to the necessity of legislation for controlling the actions of bee-owners in regard to bee-diseases. He would welcome a reasonable law regulating this matter; but that will only be by the extremists on either side sinking their prejudices, and agreeing upon a mutually beneficial and moderate line of action.

S. SIMMINS.

QUEENLAND,
HEATHFIELD, SUSSEX.
MAY, 1914.

PARTIAL VIEW OF THE AUTHOR'S HEATHFIELD APIARY.

Show me an owner of bees who is a genuine enthusiast, be he or she a novice or professional bee-keeper, and I see the man or woman who is going to succeed ; whether the occupation is adopted as a hobby or a business undertaking. The non-enthusiastic owner will never succeed in the management of the honey-bee.

CHAPTER I.

BEE-CULTURE AS A PROFESSION, AND FOR RECREATION.

THE production of Honey on a commercial basis being now an established industry, there are many inducements offered to those who wish to take up a light and pleasant occupation, as a secondary aid in augmenting a perhaps too restricted income ; or as an adjunct to farming, or even as the principal item upon the farm. As will presently be shewn, almost the entire farming operations may be made subservient to the need of the bees, so that the agriculturist's profits may be almost doubled.

In the case of fruit farming, too, the benefits to be acquired by the culture of bees on the spot, cannot be overestimated, for the better the fertilization of the bloom, the more productive will the fruit trees become.

A natural ability, and a rational enthusiasm are necessary for the making of a successful bee-keeper ; and therefore, unless a man makes himself thoroughly acquainted with the peculiarities of bees, he is doomed to disappointment should he attempt to give his time and capital to this occupation.

There are two courses open to those who wish to follow the art of bee-keeping, whereby to gain a living, or for the purpose of adding to their present income. First, by having a few hives, and gradually increasing the number

over a term of years, until the experience gained justifies one in making extensive additions to his working stock; though, unless under such very favourable circumstances as are sometimes found to exist, it will be unwise to discard any present occupation. By far the better plan will be to

Work in some Established Apiary

for a couple of years, if possible. By so doing, you save time and money; your plans must be more definitely formed, and the solid experience thus gained will be far more certain to put you on the right road to successful management than half-a-dozen years spent in working up a small apiary. You start at once with all modern material; and, buying in large quantities, a considerable reduction will be gained; whereas, many of the appliances collected from time to time, under the former condition of preparation, have become valueless by the time the apiarist enters more largely into the business, leaving out of the question that much of his material may consist of odd patterns, and cannot be used to the best advantage.

The man who has served his time in a large apiary will next have to consider how he is

To obtain the necessary Materials.

In the first place, there is more risk in buying his bees than he is likely to incur at any future period of his experience. Many buy bees of irresponsible advertisers, and though the latter may consider there is nothing wrong with them, the purchase often turns out simply worthless.

If it can be so arranged, the student should by all means buy his stock from the apiary where he served his apprenticeship. He ought to know something about the condition of the same, and may rely upon the proprietor

treating him honorably. Failing this, the owner will probably know where and how he can secure stock that can be relied upon.

Under ordinary conditions there is a certain risk about bee-keeping; but the reader, by refering to the chapters relating to Planting and Breeding, as well as the general conditions and cure of disease, will at once see how the whole thing can be rendered a certainty by those capable of following out the instructions to be found therein.

The Choice of Location

is another matter requiring serious consideration. It would appear unnecessary to advise a bee-keeper not to establish an extensive stock in a district where an advanced apiarist already has many hives; but he should not settle his bees in large numbers close to a town, or near a public highway. Select some quiet spot, in a valley if possible, and the further from any manufactory the better, but do not lose free communication with some large centre, or railway convenience.

When you know that you will presently be entering into the business, have a good look around, and endeavour to secure a few acres in a district favourable to the undertaking; a locality abounding in clovers, with the White or Dutch, in particular, as that most to be desired, and ensuring the highest average returns. Unless other conditions are exceedingly favorable, the absence of White Clover will result in indifferent returns, if not actual failure. This clover is sometimes grown as a crop, but more frequently the bee-keeper relies upon what is to be found in nearly all pastures, as well as by the road-sides, where the grit is very suitable to its growth. There is the Yellow Trefoil in May, also the *Trifolium Incarnatum* (Red Italian Clover); in July Alsike Clover, and after the White

has bloomed from the early part of June, as a crop, until near the middle of July in the pastures, there are the Limes in some places, yielding much nectar. The Sycamore, too, generally gives a quantity of honey in May ; then there are market gardens growing the various small fruits ; also large orchards, the honey from which, though not often large in quantity, is of considerable value to the bees while supplying the wants of a rapidly increasing population. It is seldom all the foregoing are to be found in the neighbourhood of Heather, though in Autumn it will pay well to move bees to the same if within a reasonable distance, as the honey generally commands a good price.

On chalk soil, particularly among the South Downs, we find the first crop of Sanfoin early in June, and the second about the middle of August ; Wild Thyme in July, and numerous wild flowers of the thistle family during the Autumn ; as well as a species of Trefoil (*Lotus Corniculatus*) during the Summer. Red Clover is also grown in great quantity, upon the second crops of which some of the foreign races of bees can work ; and as the first cutting of this plant would otherwise be very light, Yellow Trefoil is mixed with it, and this flowers freely for nearly a month before the first mowing. The blackberry must not be forgotten, in some parts being so abundant as to give quite a surplus of fairly good honey. Privet hedges, after further experience, I am inclined to regard with suspicion, as yielding poisonous honey ; while the Laurel, when occasionally in flower, is decidedly injurious.

The Ivy, both wild and garden varieties, will often keep the bees busy during October, giving perhaps a little honey, but certainly a great quantity of pollen when the season is mild.

Should the bee-keeper's lot fall upon any spot not favorably situated, and expecting to work many stocks, he

can only do so by making such arrangements as will allow him to

Grow suitable Crops

which will also do for hay, and even in a good district he would do well to have some large crops going throughout the whole season. I have sometimes been asked

What Amount of Capital should be Invested

to ensure a certain income ; but, considering I know nothing of the capabilities of those who apply by letter, it would be useless to attempt a satisfactory answer other than such as can be found in the estimates offered, and in many cases it would be unwise to give any encouragement at all, where the fullest particulars as to locality and personal qualifications are not given. Everything relating to his surrounding honey-producing plants and trees should be well known to the advanced apiarist, who will not be certain of success on a large scale just because a few particular colonies have yielded comparatively large weights. He will first find it his duty to pay the greatest attention to securing the *highest possible average* return from his stock, both by carefully breeding by a process of selection, and systematic union of forces, that immense populations may be on hand at the right time. He who has thus far mastered the science, will have no need to ask the foregoing question, but the list of estimated expenses may in some cases aid enquirers to obtain much needed information.

It should be almost unnecessary to point out that "everything must be done at the right time ;" there must be "a place for everything, and everything should be in its place." Thus by constant and careful attention, and by keeping all things in order, the specialist will command success ; but the man who is not naturally of an orderly

and temperate disposition, and moreover is not enthusiastic, and a lover of Nature (the natural qualifications of a bee-keeper), had better keep out of the business, or failure will surely be the result. At the same time, it is by no means certain that reverses will not occasionally be met with by the most expert and painstaking man ; but such difficulties should be looked upon as inducing a greater stimulus, with renewed effort and more determination to overcome every obstacle.

The Estimated Expenses for the First Two Years will be found in the Appendix, the apiarist, having had two years' apprenticeship, starting with not less than 100 colonies, and with some £500 as his capital ; otherwise he will struggle on for years before his business can be satisfactorily established. This will be admitted by many who have gained their experience by a long and laborious process.

The greater part of the expenses go towards stock-in-trade ; but after the second year, the outlay will be smaller, while the returns will be considerably higher, as the apiarist consolidates his working force. The quantity of sugar required may amount to more or less according to the season, and the extent to which the bees are deprived of honey. The better management is that whereby the largest surplus is obtained *without depriving the stock-chamber* of honey at all ; in which case the labour and expense involved in feeding will often be unnecessary. Having charged the cost of bottles and tins, the same should be added to the selling price of the extracted honey, as showing the more correct estimate.

Number of Colonies.

In reference to the estimates given in the Appendix, it will be seen that it is proposed to keep the number of

colonies but little over 100, increasing the first year to 125; the second season to 150. It is then understood that 25 stocks are to be sold; when the remaining 25 over and above the 100 will provide against all accidents, such as weak colonies, loss of queens, etc., during the winter; thus ensuring that the number shall not fall below 100. This is as far as any one person should attempt to extend until he is very certain he can manage more. With that number no assistance is required, but when greater extensions are decided upon, the apiarist should get some intelligent lad, and take care in teaching him to become an expert assistant. It is surprising how quickly a youngster takes to the various manipulations, and in this line he will, more often than not, be of more service than a man at much higher wages.

Where the apiarist is capable of making up most of his own appliances, his time will be mostly occupied during the winter, and then timber will stand in the place of many of the articles enumerated, making a considerable reduction in cost. The owner's labor in the apiary has, of course, not been estimated, as that can only be valued by the balance of profit shown at the end of the season; the laborer is worthy of his hire (profit).

The Average yields per Hive

for both comb and extracted honey, taking a series of years, have been placed on a fair basis, but in a fairly good district the bee-keeper should have no trouble in exceeding those figures, if there are not more than a total of 150 colonies standing in his area, or range of bee-flight. In a very favorable locality, or where the owner plants bee-forage, the average will be still higher, and more stocks may be placed in one apiary without any apparent diminution in the "out-put" per hive.

The editor of the *British Bee Journal* states that he obtained 1,360 lbs. from seven hives. This was extracted honey, but his results in comb have often exceeded 100 lbs. per hive. These weights were obtained from a limited number of stocks; it will be seldom, however, that such returns will be gained where a larger number are to be managed. I have had 50 lbs. stored by a single colony in seven days: and in 1886 had a queen sent me, whose bees, without attempting to swarm, had given upwards of 250 lbs. of honey, about 200 lbs. of which were in nicely-finished sections. Such results show what is possible if the apiarist will always breed from the best strains, as set forth in the chapter upon that subject.

What Kind of Honey to Produce.

It has often been stated that it pays best to run an apiary for extracted honey, but my own opinion is that to obtain the most desirable crop, the apiarist should work for both that and comb honey. Certainly a larger quantity of extracted honey can be obtained, but this will stand in the proportion of 50 to 30 lbs. of comb. Most practical men will admit this is correct, and upon this basis I have made out the estimates. It will be noticed that there is little difference between the first cost on stock-in-trade, whether comb or extracted honey is worked for, but the season's produce of extracted honey costs for receptacles more than three times that of the other. After the combs are once established for extracting, with no further outlay in foundation, and a large quantity of new wax from the cappings, the balance may be in favour of this class of honey; but against this we have to place more labor, and that not of the cleanest. I have published these estimates that the bee-keeper may have a ready means of making his own comparisons, and be more

certain of what he is about; and I do not, by any means, intend the estimated returns to be taken as implying a certainty.

Dear reader, throughout these pages will be found my utmost desire to save you from the mistakes made in the past by myself and many others. Experience is of course the best teacher, and its lessons nearly always leave on record instances of failure, of a more or less serious nature, which has to be met before final success can be ensured. Experience thus gained is of value to others starting out upon the same course, just in proportion to their willingness to be guided by the advice given. Right here I must insist upon

One Point of the Greatest Importance.

When you have decided to make a start upon a large scale, purchase your bees, in one lot if possible, during the month of April or May, and have them removed to your own place at once. I do not contemplate that the transaction will take place at any other time, and can certainly give no advice for obtaining them at another date, where the highest possible returns are desired from the first season's work. If you begin earlier or later, earlier in particular, the first great mistake is made, and very likely one which will be the cause of ultimate failure.

I have known apiaries purchased during mid-winter, and sent many miles by rail, to be simply wiped out before the summer arrived; the seller thereafter being sued for damages, and made to refund a large proportion of the value, because the purchaser could shew that some of the stocks were slightly diseased, and considered that was the trouble; whereas the fault was mostly his own for making the purchase and moving them at that unseason-

able time, and thus making it impossible for the bees to regain their normal hibernating condition.

Other stocks moved in February or March, have dwindled terribly after a long railway journey, simply because the bees that had wintered were unfit to bear confinement, and thereafter, through the too-early excitement soon wore themselves out, without first being able to renew the population of the hives.

Bees moved in April or May

undergo just that condition of excitement which induces healthy activity at exactly the right time; the queens become equally energetic under the consequent stimulation; and better progress is made than if they had not been disturbed. If moved in February or March the same excitement causes the loss of thousands of the older bees, through flying for what they cannot obtain at that early date; the large patches of brood lose the warmth hitherto afforded by such workers, and the hive deteriorates to such an extent that the whole season is unprofitable. By purchasing as I advise there are plenty of young bees to fall back upon if the stocks have been properly selected; you get only good stocks which have stood the ordeal of winter; there is no further risk, and the whole season is before you. These statements are based upon hard facts and experience, and the reader will do well to be guided thereby.

So far we have considered one branch of bee-keeping only, but another thing is the

Sale of Bees and Queens.

This is most profitable, more certain, and the returns quicker than when producing honey; but, at the same time, special qualifications are necessary to enable a man to conduct a queen-rearing business successfully, and unless

he finds himself peculiarly adapted to the undertaking, he had better confine himself to honey, as continued application, constant care and thought, are required in a much higher degree, to enable one to carry on this interesting work. It should also be understood that where bees and queens are raised for sale, the apiarist will have to be satisfied with but a limited quantity of honey; in fact, if his demand is large, in some seasons instead of a surplus, a considerable amount of sugar will be required for winter store, while his stock is seriously handicapped during prolonged spells of bad weather, when many virgin queens are on hand. It will take some years to gain a connection, and in the meantime your advertisements must be frequent, but limited in extent and cost.

Do not attempt much in the way of selling bees and queens until you have a substantial stock of at least 100 hives to draw upon, or you will never obtain much benefit from them if you are depending largely upon this source of income.

Still another department is connected with apiculture;

The Manufacture of Appliances

is carried on by a number of reliable men, each of whom has an apiary; some of them add the making of comb-foundation, while nearly all find it necessary to continue some other business. I do not mean to imply that no good is ever to be done in a small way; but it is better for the beginner who can turn out a decent article to confine himself to local requirements, while continuing his usual occupation. Even well-known firms often turn out cheap hives to meet a certain demand, that are not creditable either to the maker or the user.

It is so far doubtful whether honey-producing alone will ever become a reliable source of income except under

particularly favorable conditions, or where conducted in connection with growing crops on the farm, but with the manufacture of appliances and foundation, the sale of bees, etc., it is possible to secure good returns where capital is judiciously invested, and labor is economised. There are several rural occupations that can be carried on in connection with bee-keeping to advantage. Fruit-growing is generally profitable to those who understand its culture. Poultry, on a small scale, can be made most profitable, and a large portion of the proceeds, in eggs and fowls, may find their way to the owner's table, in addition to those sold. Other pursuits may occur to the individual bee-keeper, such as may not seriously interfere with the main occupation, though his surroundings, and space at command, will largely influence his plans.

Bee-Keeping for Recreation.

While the greater number of amateurs endeavour to get all the profit they can out of their bees, there are many who keep them because of the pleasure afforded by studying their habits; though, of course, the delight experienced in being able to place pure honey, in its most chaste form, upon one's own table, and that of friends, is by no means a secondary consideration. Nothing can be more appreciated than a present of beautifully white honeycomb in sections or bell-glasses; and what, moreover, can exceed the pride and pleasure of thus being able to present that which is your own production; a thing of beauty, which has been gradually "growing" under your fostering care.

The busy man who occasionally spends a few minutes with his bees, finds healthful and soothing recreation for both body and mind; and fortunate are those whose leisure gives them almost unlimited time to carry out the study of these remarkable insects. It can truly be said

that they are a never-failing source of interest, there being always something new to discover, either as to their habits or management.

Modern bee-keepers are usually enthusiasts, and among all who study the subject there is a general understanding and mutual sympathy. The novice may therefore go to his nearest neighbour who may be following the pursuit, and be certain of a hearty welcome, and a free gift of all the knowledge about bees that he may have gathered by many years of practice; but nevertheless, just here, I advise the beginner not to go to his more expert neighbour every time a difficulty occurs. He must bear in mind his past lessons, and strive to help himself.

It does not much matter at what time of the year you may begin in a small way; you have first to gain confidence in handling bees before you can make much out of them. Get some friend or other apiarist of experience, if possible, to overhaul the stock you wish to purchase, and be guided by him as to its value. In the absence of friendly advice, you cannot do better than buy a first swarm from some cottage bee-keeper. Obtain your hives from a well-known maker, and do not select the cheapest style, as makeshift hives of this class are dear at a gift, and your expected pleasure will be somewhat marred, and your manipulations sadly complicated.

While the number who may be capable of making bee-keeping their main occupation will be limited, almost anyone can keep a few colonies at great advantage to health, and at the same time make them pay their own way. Even the scientist need not go to any great expense over his investigations, as with ordinary care his bees can be made to return all the money he may require to lay out for such purposes.

The cry of "over-production" is but a false alarm, and

we need not fear, however many become honey-producers in our generation. No genuine article of food will long want for a customer, if only it is presented in an attractive manner at a reasonable rate. There are many ways in which honey can be utilised, not only as food and medicine, but also for a number of manufacturing purposes; and while many others will continue to enter into the occupation, the value of honey will become more generally known, to the advantage of all concerned.

It may be taken for granted that the prices of all articles of food reached their lowest level about the year 1910, since when everything has advanced in value. We may not again see a period of low prices, as for all practical purposes the world has reached the limit of comparative production. This is a condition accelerated by the means of rapid intercommunication of late years, though in the meantime this resulted in low prices. New worlds are now becoming as old worlds, with dense populations, which demand food from the newer countries, and these, in short course, will have larger populations to support.

It is as easy to handle bees as flies; nay, more so, when one is once acquainted with their peculiarities and temperament under varying conditions. The owner should always be assured that his little friends are under perfect control before he proceeds to carry forward any manipulation.

CHAPTER II.

HOW TO HANDLE BEES.

AMONG the uninitiated the general impression is that bees are certain to sting if molested, but if let alone they will not touch one. This is to a certain extent true, and while a novice would generally be unable to open a hive to take out the combs and bees without being attacked, the expert may do almost anything with neither veil nor gloves, and seldom receive a sting. Of course, the difference is that the former has not yet gained that caution and confidence necessary in all his manipulations, and this will come only by practice; no one can give him the desired skill to start with. A calm and deliberate motion should be acquired by all who hope to handle bees successfully. I have known those who were looked upon as experts to have a very unpleasant manner while manipulating bees, making it unsafe for any unprotected companion, and disturbing a whole apiary for days. Though such operator may not himself mind stings, this carelessness should be overcome if the owners visited are to have any pleasure in their apiaries.

Precaution against Robbing.

Where an expert is called upon to put an apiary in order, or remove the crop of honey, difficulties are likely

to occur before he can get through a large number at one place, if precautions are not taken. As far as possible, while on a tour the larger apiary should be visited last, and the work so timed that it will be completed towards dusk, and no combs from the extractor should be returned till then. These remarks apply to Autumn in particular, though there are other periods when honey is not coming in, and not only then, but at all times the owner should be very careful not to give his bees a chance even to *start* robbing, with its consequent fighting, loss, and annoyance.

Preventive measures are of course the first consideration, and in the case of fairly large apiaries some bee-proof shelter is a great necessity, as many operations may there be carried on which would be impossible in the open. Many of the stocks may be carried into such shelter for examination or deprivation; and besides being invaluable for extracting, will be found most useful for queen-rearing and many other purposes.

If through negligence in carelessly allowing honey or syrup to be exposed in the apiary, the

Robbing Mania

has once commenced, as may also be induced by the injudicious opening of hives, or badly fitting floors, etc., then the uninitiated will find he has let loose a power which will require his coolest judgment to enable him to subdue. I have known horses, chickens, dogs, and other animals severely attacked by bees because the skep of a neighbour having been placed upon an old block cracked in every direction, offered capital openings for a host of determined robbers, whom I found coming and going like some irresistible hurricane. All openings, except one reduced to a $\frac{3}{4}$-inch tubular passage-way, were immediately stopped; the watering can was freely used,

and dripping sacks left over the skep. In a few minutes all was quiet. Where the ire of bees has been aroused by the careless removal of honey in Autumn similar difficulties are likely to occur, but in this case they will remain irritable for days or weeks, unless fed with a little thin syrup in the evening.

Robbing in the same apiary is sometimes cured by making the attacked hive exchange places with that of the assailants ; carbolic acid in solution, on cloths placed about the front of the unfortunate hive, will put an end to the disturbance ; and where all the stocks in an apiary can be fed up simultaneously in the Autumn, there will be no further inclination to rob, and all the necessary work may be completed in comfort.*

Serious Robbing develops in Early Morning.

It will be found that bad cases of robbing nearly always start early in the morning, before the owner is about. So convinced has the Author been as to this fact, that he is always on hand as soon as the bees may move about, especially during mild Autumn mornings.

Some entrances may face the early sunlight, and the bees are on the move, while others, especially if they be nuclei, standing in the shade are not on guard. But one load of honey carried home, and soon excited pilferers in hundreds are mysteriously directed to the same sweet source, and all opposition is brushed aside by the determined onrush.

His first approach to the apiary should inform the owner if any bees are darting about with unusual determination, even before he sees them. A handful of grass hastily thrown against the entrance is of course the handiest thing

* This simple method of quieting the whole apiary was given in the 1893 edition of this work.

for the time being, as it checks the marauders; but the best plan is that of

Puzzling the Robbers at their own Entrance,

a point too frequently overlooked. The most determined onrush of pilferers can be stopped at once, and everything be quiet in five minutes, if their own entrance is at once disguised by placing a sack over the front of the hive, leaving the returning thieves just a small opening at one side.

The sack may be drawn closely at the sides in the evening, giving but slight egress rather late in the mornings for a time. This is better than distressing that lot being robbed, though their entrance may be reduced, or protected by a shallow funnel made of perforated small hole zinc.

Having shown that the first care of the apiarist is to be cautious, that his bees may always be held well in hand, it will now be desirable to consider under what conditions they may be handled without fear of being stung. We will first note that as a rule,

Clustering Swarms do not Sting.

Nearly everyone has noticed how readily a new swarm may be handled; the bees having no inclination to sting. The reason is not so much that they are full of honey, as is usual in swarming time, but that they are homeless, and have only recently been under great excitement. By the aid of some intimidant, the bees of an established colony may also be excited and made to fill themselves with honey, when the combs can be removed at will. It does not happen, however, that all the bees rush to the cells; I have frequently noticed that many do not attempt to do so, but these may be already loaded, though the state of excitement is so soon communicated to all that

none, as a rule, attempt to retaliate when the hive is examined.

When necessary to look into a fixed-comb hive (commonly called a "skep") first drive a few puffs of smoke in at the entrance from a bellows smoker, as illustrated, which is of the "Bingham" pattern. Give the sides of the hive several sharp raps, then turn it up in a line parallel with the combs, so that none may fall on one side, when, after a little more smoke driven across the now exposed combs, any necessary examination may be made; though of course the investigation can be little more than a superficial one. The smoker is so arranged that when placed in a vertical position there is a continuous draught, but if put down the other way the draught is at once stopped, and the fire goes out. While it is desirable that no more be used than is really necessary, the operator should on no account proceed until he has used sufficient smoke or other intimidant, that he may be quite certain he has the bees well in hand. Many overlook just this necessary precaution, causing needless loss of bee-life, as well as inconvenience to others, if not to themselves. After any operation these little insects should, if carefully treated, be no more disposed to sting than before. Of course exceptions to this rule will be met with, and while at some more favorable seasons, and with some quieter races of bees, little or no smoke may be needed, there are other stocks nothing seems to thoroughly subdue; and though these are often the best honey-gatherers, the novice will soon want to be rid of them; this is best done by deposing the queen, and giving one from a quieter strain. When it is desired

To Drive and Transfer

bees from a straw skep, or other fixed combs, to movable

frames, then after smoking and inverting the old hive, let its crown rest upon the ground; place an empty skep or box above, fitting exactly mouth to mouth, and then continue to rap upon the sides of the lower hive with the hands, or a stout stick; but on no account jar in such a rough manner that the combs become broken from their attachments, or many of the inmates will be smothered in the honey. Soon the bees will be heard roaring on their march upwards, being in fear of the trembling combs falling about them. In the first instance a cloth may be secured around the junction of the two hives, thus ensuring that no bees rush out; after a few minutes this should be removed, and the upper skep tilted from front to back, having first been secured to the other by a skewer, or anything that will keep the rims together without shifting. The operator will soon prefer to do without the cloth and keep the skeps parted from the first, when the queen may be captured as she ascends, if desired. It should be so arranged that the back where the bees are to run up should be the highest point, and that at the ends of the lines of combs, or the bees will not go up readily. Then transfer the combs to the frame hive if they are not irregular, and return the bees, as explained in Chapter XIV. One is often told to procure a pail or table whereon to place the skeps while driving, but the operator will find the earth a far better "stand" than any other.

Bumping.

After first intimidating the bees, another way to get them out, is to invert the hive and give it one or two sharp "bumps" on the ground, at the edge of the crown on the side parallel to the combs. If carefully done the combs break away from the sides and top of the hive much cleaner than they can be taken out by any other

way. Brush the bees off into an empty skep with a feather, and transfer the combs as desired. This plan was first introduced by Mr. F. Lyon, and is very simple and expeditious.

Throwing.

This is quite an old plan, and where the combs are fixed, either by cross sticks through them in skeps, or in shallow-framed hives, nothing can exceed its simplicity and rapidity. Place an empty hive on a sheet upon the ground, mouth upwards; stand over the same with the stocked hive held by the hands at the rim between the legs of the operator; raise the hive and lower it quickly, then stop the motion with a sudden jerk just as the empty hive is neared; repeat as often as necessary and the bees will be all thrown out. Wait a few minutes after smoking them, lift the hive and proceed, when the bees having discontinued feeding at the cells, will come out more readily. This rough and ready process was carried out only with the cross sticks through the hives and combs so that the latter could not fall; and Mr. Heddon has more recently adopted the same thing with his shallow fixed frames. In the case of frame hives the bees will be shaken down on the top, or at the entrance of the lower hive, by handling one frame at a time.

Manipulating Bees in Frame Hives.

The foregoing operations are seldom necessary with movable-comb hives, as each frame may be removed at will, and this meets all requirements. When any operation has to be carried out, first lift the material covering the frames, and drive a few puffs of smoke among the bees, replace the "quilt," and after a few seconds peel the same off with care, and make the necessary examinations. Remove and replace each comb carefully, taking care

not to crush any bees while so doing, and see that your smoker is on hand in good order, in case they may get troublesome. If the combs are to be cleared, shake the bees back into the hive, or at the entrance by a motion similar to that of throwing, beginning however with a gentle shake, and then more vigorously, as the bees become frightened. Nothing tends to subdue them so thoroughly, and on no account should a brush or feather be used until the bees have first been so shaken; as by brushing them from the combs in the first instance they are much irritated.

Italian and Carniolan Bees seldom require to be intimidated. They can be handled almost anyhow, and what is remarkable with both these varieties, and also some stocks of Syrian bees, it matters not how long the hive may remain uncovered, they continue perfectly peaceful. With these, begin by peeling off the quilt gently, and then proceed to remove the combs in the same manner, and hardly a bee will take wing. Get them from the combs by shaking as above, when necessary, and no stings will be given as a rule.

Uniting.

Where bees are in fixed combs, drive both (or all), then remove all queens but the one wanted; stand the combed hive to receive them in an inverted position near to where they are to remain and throw all into the one. As soon as the bees are a little settled turn the skep right way up on two 1-inch sticks laid on the floor board; remove such sticks in the evening and see that the entrance is not less than 3-in. by $\frac{3}{8}$-in.

Bees in frame hives can be joined by alternating the combs of one with those of the other. Smoke each hive and then part the combs so that no bees hang from one to the other, and then proceed to unite the two. Leave

only one queen, cover up carefully and do not disturb them again. If two standing near together are to be united, move the hive to be occupied half-way between the two, and take the other hive right away. A board placed against the entrance, slanting to the ground, will aid the bees in collecting at that spot, while the original inhabitants of the hive will also feel in a strange position.

If both (or all) lots are smoked a few minutes before uniting, and the bees presently shaken from their combs and mixed up in the hive to be retained, fighting will be out of the question.

Late Autumn Uniting.

In general, when preparing for winter I nearly always wait until October and November, and then a stock can be carried any distance in the same apiary and joined to another, with little loss of flying bees, as none get far from home at that date, and not flying frequently they will always make a note of their new position. Many use thin syrup scented with peppermint wherewith the bees are sprayed, thinking that a common scent will make them unite peaceably, but there is no need for anything of the kind, if but one queen is allowed, and my directions are followed with regard to separating the combs of the respective lots and fully exposing the whole of the bees to the light for a few minutes before the union is accomplished.

Another very satisfactory way is that of removing the best of the brood combs, and adhering bees of a colony to any distant hive requiring them, while the remainder may be united to any neighbouring hive, without the possibility of losing any flying bees. The queen, if one, being utilised as may be most desirable.

Uniting Queenless Bees.

By uniting after three days from the removal of one queen, the operation is usually perfectly safe and satisfactory, while if both colonies had been queenless prior to uniting,* the merest novice will find no difficulties in the way of this frequently dreaded operation.

In the former case the selected queen may be caged in the queenless lot about mid-day, and the bees united in the evening.

I have frequently been asked how to prevent fighting when placing one stock over the other. I have sometimes suggested wire-cloth between the two; but a still older plan I have advised has been that of placing a sheet of newspaper between, with a few holes pricked through the paper. This is not very tidy, but is always successful.

Uniting by Exchanging Combs

a day or two beforehand, is also another novel item I have frequently offered to my correspondents. This is particularly useful where a nucleus having been confined in transit by rail or otherwise, is to be united to a weak stock on arrival. If the nucleus is placed near the stock and given a flight, it may next have one or two of its combs (without bees) exchanged for the same number from the stock, and the union completed during the third evening thereafter.

Sprinkling with flour when uniting has been brought to notice through the columns of the Bee Journals; and there are many who will gain confidence by using it, though probably in the hands of a novice, careless handling will even then bring about a disaster occasionally. During the season I am daily uniting bees under all

---

* This plan of making both stocks queenless before uniting was given in my 1888 and following editions.

conditions without any extraneous aid, and always without fighting; therefore to me the various recommendations are simply amusing.

In the case of Cyprians and Syrians some caution is needed, but I have found that if both lots are *first made queenless* these bees can be united without the least inclination to fight whilst in that condition; the queen to be retained being returned in the evening. Except it be in the middle of the day during a good flow of honey *nothing else* will induce these bees to amalgamate with strangers.

Agents used in Quieting Bees.

The late Mr. F. Cheshire mentioned that methyl salicylate, using a few drops on the hands, will effectually prevent bees attacking the same.* Diluted vinegar, carbolic acid and Izal, will, I have found, answer in like manner. The same author also recommends a small amount of crude creosote placed upon the fuel in the smoker for subduing any colonies not amenable to milder treatment. The late Rev. George Raynor long used carbolic acid for quieting bees; his plan being to dip a feather in a weak solution of the acid and then pass it over the frames, when the bees rapidly retreat. Fume chambers added to bellows have also been introduced, and while I have no wish to disparage those who have invented these methods of applying carbolic acid, I am compelled to say that for general purposes I have found nothing to equal the smoker, and in extreme cases the creosote or other pungent article added to the fuel.

Gloves.

While I can but regard gloves as a great hindrance to manipulation, it is necessary that the novice should

* "Bees and Bee-keeping," Vol. II.

commence with something of the kind, just to give him confidence. Thick woollen gloves dipped in vinegar and water, wrung out, will answer better than anything, but as soon as possible these should be discarded.

Veils.

These should be made of fine black netting to protect the face, while any white material will do for the back, and will protect the wearer from the heat of the sun. Elastic should be run round the top so that it will fit tightly about the hat ; and the length should be such as will enable the lower end to be tucked securely inside the coat collar.

Sweetened Water for Quieting Bees.

In cases where very vicious bees have to be dealt with, or when a novice thinks he may be some time finding a queen, and particularly if he wish to hurry the operation of "driving," then first sprinkle the bees with a little sweetened water. After two or three minutes, all will be as harmless as flies.

Bee Stings

are, of course, dreaded by the bee-keeper when he is making his early attempts at manipulating, and occasionally he is so severely punished, even by a solitary sting, that he may begin to think seriously of giving up. In a few instances the difficulty is never overcome, but as a rule the apiarist becomes in time, not only used to, but quite careless of bee-stings. The system becomes inoculated, and whereas formerly uncomfortable and even painful swellings may have followed a sting, after a few years little is felt beyond the first sharp prick.

As for myself, I can hardly tell where the place is within five minutes after being stung, the little weapon usually being scratched off, or quickly brushed away against the

Fig. 1.

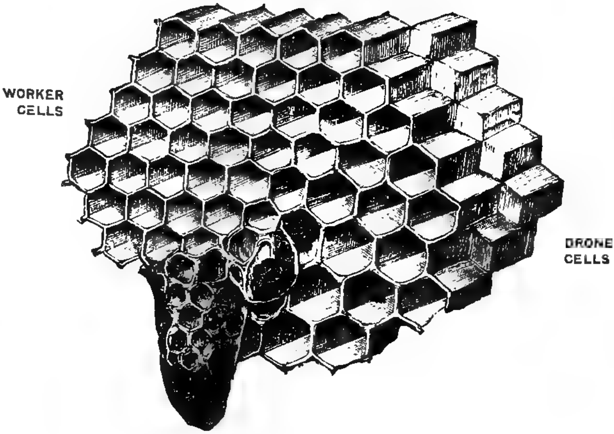


Fig. 2.

QUEEN

Fig. 3.

WORKER

Fig. 4.

DRONE.

clothing. The white part seen at the rear of the sting being the poison bag should never be pinched when removing it, or the remainder of the venom may be pressed into the wound.

The Sting may be Removed by the Bee, contrary to general statements. It is not usually done, because the bee is, of course, hastily knocked off, so that not only the sting but part of its body is also torn away.

When the reader becomes so inured to stings, that when a bee darts straight at his hand, not a muscle will quiver, no matter what operation he is carrying out, then he may perhaps do as I have done—allow the bee to remove its sting in its own way. As soon as the first act is over, the second very natural act begins, in that the bee rapidly spins round upon its sting as a pivot, while all the time drawing away from the wound. Thus only can the barb be withdrawn, and the bee having vented its anger retires, without being in any way injured.

Rheumatism, Stings, and other Things.

It has been frequently suggested that bee-stings will cure rheumatism. It is possible that some isolated cases may have appeared to be benefited as a result of the application. One might as well suggest that bee-stings will cause death, for as a matter of fact about as few of each event have occurred as a result of the injection of the formic acid.

The application of bee-stings is on a par with the barbaric practices of leeching and bleeding, and about as unscientific as those now discarded practices. It is useless hoping to permanently cure local affections while the seat of the trouble—the digestive system—is neglected. The patient should be restricted to a temperate diet and the use of honey instead of common sugar.

Swollen joints will then more readily be relieved by warm bathing, by soothing poultices, and by gentle massage.*

As a dietetic cure I have known the constant use of apples most beneficial in expelling the uric acid. The pain and stiffness is caused by this poison accumulating in the veins, more especially at the joints, in the form of crystals, and the best cure must be that which frees the system from that acid, or prevents an accumulation of it.

This is Important.

When at rest the patient should as far as possible, straighten his limbs, or fingers if also affected. It is so easy and apparently restful to bend one's limbs when in repose, and undoubtedly that position aids the deposit or accumulation of uric acid at these artificially-made bends in the crimson rivers that ought not to be so obstructed.

Cures for Bee Stings.

The usual remedies are seldom effectual, for the reason that the poison instantly circulates in the blood, and the usual period of three days occurs before the swelling goes down, when a person may not yet have become inoculated.

Vinegar may allay the irritation, while sometimes a raw onion cut in half, or damp earth laid on the wound, is advised by old skep hivists. In any case cold water should be avoided, as tending still further to check the circulation.

Warm Water Applications,

on the other hand (really applied as hot as can be borne), will reduce the swelling and irritation in the only natural

* Dr. Macaura has made good his claim that his pulsocon treatment will break up and distribute the acid crystals in the blood. The Magic Foot Drafts have proved effectual, under the Author's observation, in withdrawing uric acid from all parts of the body.

and effective manner, both by actively relieving the congested blood, and sending it coursing through the veins; thus diffusing and thinning the poison, while at the same time the pores of the skin are fully opened and are aiding in giving prompt relief. While considering this subject, it would be well to remember that

A General Application of Hot Water

would save many a limb, many a life, and many a doctor's bill. People, as a rule, even highly-educated persons, have not sufficient confidence in themselves, and but too frequently send for the doctor, who, perhaps, knows less about their own peculiar ailment than they should do themselves.

Many a well-meaning practitioner has brought a limb from bad to worse, by using his "stock" remedies, or by advising cold water applications, until in the end the poor limb is taken off. And yet it might have been saved, and made as good as ever, in many cases, by mere rest, and no applications whatever; while in most instances the cure would have been rapid and effectual had Nature's own remedy been applied from the first.

Moist Warmth Alone

generated life, maintains the function of life, and that alone when rationally applied effectually restores deranged members. In sprains, it relieves the painful part, by thinning the congested blood, and again setting it in motion, bringing into its place the new and life-giving fluid, which immediately sets to work in renewing the bruised tissues, and carrying off the worn and wasted cells. Congestion — inactivity — is death; movement — circulation—is life; and circulation of the blood is only secured by moist heat.

The most valuable member of the hive community is the queen. A fertilised queen deposits none but fertilised eggs, resulting in neuters, drones or queens, at the will of the workers. A mis-mated queen produces mixed-bred drones, workers and queens.

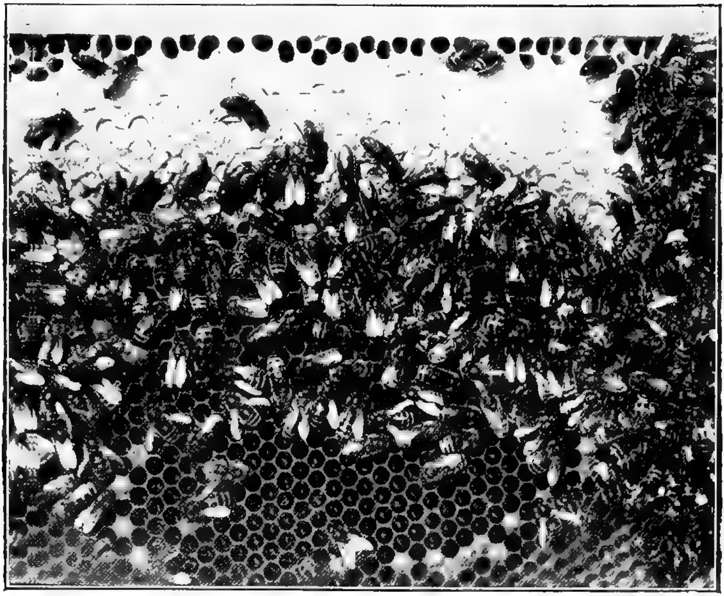
A non-impregnated queen, like the occasional laying worker, can deposit none but drone-producing eggs, the males from which are not fully virile.

CHAPTER III.

THE ECONOMY OF THE HIVE.

PRESUMING a swarm has been duly hived in movable frames, each of which has a wax guide down the centre of the top bar, we shall find that the bees begin to extend themselves in festoons from the highest point should the hive not stand on the level; if perfectly flat, then the cluster is formed near to one side, and forthwith waxen cells are added to the guide placed to ensure straight building. If the weather is favorable, the delicate white comb will be found to increase rapidly in semi-circular form, until the centre reaches to within ¼-inch of the lower rail of the frame, when the side spaces are soon filled in. Sometimes combs will be started in different places along the guide, and as the circular edge of each nears its neighbour, these are joined, and the several united continued as one comb; but in this case we may frequently observe many irregular cells at the line of junction.

By using a sheet of glass next above the frames, or better still, my glass rail sections, kept warm with woollen material, the interesting operation of comb-building may



Bees at home—lower illustration showing the bees enlarged.

be watched.* Many bees will be seen with strips of wax just removed from the "wax pockets" on the under-side of the abdomen, and this they are moulding into shape as added to the thick rim on the outer edges of the cells. This rim is always present, not only as a reserve of wax for lengthening the cells, but more especially for giving strength to the structure, and the better to withstand the tramp of many feet; the actual cell walls being as fine as tissue paper. With a few exceptions, as when joining two combs, or where drone cells meet those of the worker size, each cell is hexagonal in shape, with a base composed of three irregular squares, so that the centre point of contact is deeper than the sides; thus, the centre of the base of the cell comes opposite the junction of three walls on the other side of the "septum."

The natural distance from the centre of one comb to that of the next is barely $1\frac{1}{2}$-inch. It is not, however, absolutely necessary that this gauge should be retained, and it will be found by making the distance $1\frac{3}{8}$-inch to $1\frac{1}{4}$-inch when starting new combs that the bees will build them almost entirely of worker cells—five to an inch. When the natural distance is allowed, many larger cells are constructed; these are for storage or for the production of drones or males, their measure being four to the inch.

As soon as the combs are sufficiently advanced, the queen deposits an egg in each available cell; this remains for two days, when the workers add a milky fluid; and it may be taken as a fact that no matter how high the temperature these eggs will never hatch without the addition of such fluid. In the Spring eggs laid in drone cells may be seen day after day, week after week, during

* Although this method of observation was first described in my 1888 edition, I do not advocate glass quilts in winter, nor for general use.

unfavorable weather, simply because the workers do not see fit to have them develop, and in late Autumn exactly the same thing will occur with worker eggs laid in worker cells. The queen is allowed to deposit them, but the workers as much as say "No, they shall not hatch only to produce useless consumers."

Under favorable conditions the egg hatches on the third day, and the tiny embryo floats in the liquid, to which the bees continually add, until the seventh day, when the larva surrounds itself with a silken web, its cell being then capped over with a porous mixture of wax and pollen. According to Cheshire many more important changes then take place than hitherto have been supposed, and the student of nature will find much pleasure in perusing his work.* When fully developed, the insect bites its own way through the cap on the twentieth day after the egg was laid, and is readily distinguished by its light downy appearance. It immediately proceeds to the open cells of honey, and helps itself liberally. The youngster is generally assisted by an older bee in removing the filmy skin from its body, and after two or three days it goes out for a cleansing flight at the warmest part of the day, at the time many others are having an airing and taking stock of their surroundings. This flight of the young bees, when they are of the bright yellow varieties, is an interesting and beautiful sight.

Our little friend gets stronger daily, and, soon after the seventh day we may find her coming home with a load of pollen on each back leg in what are called the pollen-baskets, being hollow parts in the legs, with strong hair so overhanging that the load cannot fall. She enters the hive, travels up the comb to near the margin of the brood

* "Bees and Bee-keeping," Vol. I., Scientific.

nest, and after finding a convenient cell, in which quite likely pollen has already been deposited, she pushes off her load with the middle legs, which Cheshire has shown have a peculiar instrument adapted to the purpose, and which is passed down the hollow behind the pollen, and thus it is forced off into the cell. The bee will then turn round and entering the cell, presses the pellets down into a thin layer, where probably many such are already placed, varying in colour according to the nature of the plant they may have been gathered from. It is well-known that the bee nearly always confines itself to one kind of flower when out foraging, hence its load of honey is of one kind only and the pollen is of one colour ; the bee-keeper may therefore frequently tell what his bees are working upon by carefully noting the colour being brought in. Thus mustard gives yellow pollen ; white clover, brown ; red clover, dark brown ; sanfoin, brown ; willow, yellow ; furze, dark orange ; dandelion, bright orange ; apple blossom, light yellow ; pear, crimson ; poppy, black ; blackberry, greenish white ; borage and lamb's-tongue, white ; while the various garden flowers give every conceivable shade.

It is but seldom a bee gathers a large load of both pollen and honey on one and the same journey. A pollen gatherer will have little honey, while those carrying the most honey will seldom stay for a particle of pollen, more than what may be brushed into honey as collected. The pellets are brought in most freely up till 11 a.m. while everything is moist from the dew of night ; or at any time, immediately after a shower, if warm. As a rule, the honey sources of the day are about dried up by three p.m., and the bees do not often work actively after that time, except in very still, fine weather, when it is not unusual to find bees working almost up to dark, if favorable crops be near. As

in the early morning, they then carry in much water to help in preparing the food for the young, a mixture of pollen and honey,* first digested by the nurse bees, or those not yet old enough for outside work, and given to the unsealed larvæ as a milky fluid. During the warm part of the day, not a bee will be found at the water fountain if there happen to be a heavy flow of honey ; but should there be a scarcity, many will be carrying water the whole day ; even if it be raining they continue their flights to the same spot by force of habit. It is, of course, understood that bees must have honey (or syrup), but, do not at any time lose sight of the fact that in building up in Spring, it is absolutely necessary that they have both *pollen* and *water* as well.

Substitute for Pollen ; Water Supply, &c.

If there is any sign of scarcity, nitrogenous food can be given in the shape of a thick paste, formed by mixing pea-flour with good honey (syrup will not answer, as it simply cakes into a hard lump). With a thin broad stick press this into the cells of a tough comb to the extent of half of one side and place the same next the cluster. The pea-flour may also be dusted into the comb in a dry state, or in that form shaken upon shavings,† placed in an old skep or box, arranged in a sheltered corner.

Water can be given in large milk pans, either with sawdust at the bottom ; moss ; or wood to float as a resting place ; taking care that the vessel shall stand in a warm spot. It is better, however, to supply water in Spring in the form of thin syrup.

---

* Large quantities of water are also used, especially when the bees have old stores of thick honey.

† The Author does not himself practice out-door feeding of pea-flour, finding it wastes bee-life by constant flights just when the mature bees can least be spared.

Young Bees take their Share of Work.

The honey gatherer will frequently give up its load to the younger bees, returning at once to the fields, and it will be found that during the day the hives contain, almost exclusively, the younger bees not yet able to work outside. Pollen is required near the brood nest, but much of it is purposely stored and covered with honey in view of future requirements.

Young bees take a large share of the work of nursing and comb-building while the adults are busy abroad, showing remarkable economy of labor, and disproves the theory that there is no benefit to be derived from brood hatched out less than three weeks previous to the probable close of the honey harvest. During a heavy flow, which implies, of course, very warm weather, I have seen hives with none but newly-hatched bees at home, proving also that upon an emergency young bees begin to carry much earlier than is often supposed. Few of those which have gathered the stores are to be found within three weeks after the close of the season. Examine the hive, and you will find every field worker has its wings more or less worn; look again, after the interval named, and they are gone.

How the Honey is Stored.

We will now watch a bee relieving itself of the nectar brought in. Should she select an empty cell, she first assures herself that it is quite clean, and then beginning at the base, with her tongue she commences to "paint" the same with the honey slowly leaving that organ until the first load completely covers the three squares. Another load is brought, and the next bee continues the operation of "painting" the sides of the cell, but only so far as is necessary to accommodate her own load which

she is slowly disgorging.* In like manner each following bee continues the process, until the cell is nearly full, and the mouth of the same is gradually sealed over with pure wax. It will be readily understood that were it not for this process of moistening the sides of the cell, the honey would not always adhere to the dry surface, and hence much waste space would be the result. Much of the honey does not, however, remain where first placed. If the bees have room in the stock combs, it is distributed as much as possible, and when the excess of moisture is evaporated it is carried above.

The bees that leave an air space just under the capping are Blacks, Carniolans, and some hybrids. Ligurians give a thinner sealing and are not always so careful to retain the clear space, but their comb honey is quite presentable and of a really fine appearance, though that of the former is often preferred for its snowy whiteness. Cyprians, Syrians, and Palestines, however, leave no space whatever; in fact, it would appear that they even moisten the inside of the cappings, and fill the cell as tight as possible, hence their comb honey is not at all saleable. The reader will therefore use his own judgment in the matter, and only work those stocks for comb honey that are known to produce the whitest comb surface.

As soon as the wants of the rapidly increasing brood nest are supplied, stores begin to accumulate, and presently we find the upper portion of the central combs filled with honey and neatly capped, while one or more of the combs

* This observation was made in 1878 by the use of glass rail sections. As it has been denied that the bee uses her tongue as stated, by a writer in the "American Bee-Keeper" for Feb., 1907. I repeated the experiment with the same result, and must re-affirm that the worker does so moisten the cell wall, while the honey leaves the tongue, or by the tongue, as of course this member is not extended as when collecting the honey.

at one or both sides will often be a solid block of honey. Meanwhile the population has been entirely renewed by the brood hatching in successive batches, but presently no more store is to be gathered, and then the drones are destroyed; the size of the brood nest is greatly diminished, until by September brood rearing ceases entirely, unless there be a queen of the current year, and in that case, with plenty of food on hand, it will be continued until late into October. The whole of the stores accumulated by a swarm thus left to itself will seldom exceed 20 lbs., but let the reader compare this with the product of a swarm worked as explained under "General Management," and he will find that there is but poor economy in the "let-'em-alone" policy.

As the cool weather comes on, the bees which but lately appeared to fill the hive, crowd into a compact mass, occupying not one-tenth of the space. The winter cluster is formed where brood has lately been hatched, towards the central lower part of the comb; thus the bees are able to enter these cells, head to head on opposite sides, as well as cluster between, forming an unbroken mass, and so keeping up the necessary temperature. In this state the bees do not rely upon any outside covering other than simple protection from direct draught. The older the combs the more protection is afforded in Winter; but one wall of the hive, at least, that on the south side, can hardly be too thin, as an occasional gleam of sunshine penetrates at once, and so enables the bees to shift their position, and re-arrange the stores around the cluster, even though the temperature may be too low for any to fly out. Wherever the entrance may be placed, it is absolutely necessary that the frames of comb shall stand well up from the floor, so that the bees may readily find their way out when the opportunity is given them.

Providing pollen is at hand, breeding commences in all good colonies soon after the "turn of days," but at first the patches of brood are small, and limited to the very heart of the cluster, to guard against chill. It is not by any means to be supposed that henceforth young bees are brought forth without intermission ; but it is a fact, nevertheless, that a colony, failing through any cause, to produce this early batch of youngsters, will stand in the background all through the season, as presently the loss of bee-life will be so great that a late hatching of young ones cannot possibly keep pace with the deaths occasioned by almost daily flights. On the other hand, two or three generations of young bees brought to life before general flights occur, give a colony so great an advantage that no perceptible diminution occurs, and by the time spring opens, the population has been *almost entirely renewed*, so that henceforth the progress of that stock is rapid.

Presuming that the colony we have had under consideration has plenty of stores of both kinds, and a good queen at its head, at the approach of May some of the large cells have eggs deposited in them: these also hatch on the third day, and the larvæ then undergo much the same process of change as does the worker, though each condition is more prolonged, and it is not until the 25th day that the perfect insect begins to bite a way out from its cradle. Nearly everyone has heard of these burly fellows, but people generally appear to consider that a drone is so called simply because he will not work ; but the fact is he cannot work, and has nothing in common with the worker, the latter being a neuter and its whole organism so constituted as to fit it for work alone, while the drone is exactly the reverse, and being the male its sole occupation is that of fertilising the young queens brought to life during

the swarming season. It is therefore in view of this colonising instinct that the drones are now brought forward; this being the first indication that a stock is expecting to swarm at no distant date. If we suppress the production of drones then, by allowing no drone comb, one step is taken towards the prevention of swarming.

Royal Cells.

The next and more important step taken by the bees, is to build special cells, either on the surface of the combs, or more often around the edges, something in the shape of an acorn; indeed in their first stage, they are almost an exact counterpart of the cup. They may remain in this state, as they often do, for many days if the weather is not quite favorable; but in due course the queen deposits in each an egg when the cell walls are extended downwards, and as soon as the tiny larvæ hatch from these they are fed excessively upon what is called "Royal Jelly," a substance much thicker than that given to the common larvæ. From the sixth to the seventh day the developing insect has its cell capped over; it then spins a cocoon which does not completely surround itself, as the abdomen is not covered, and it is just there that the cell is torn open, and the immature queen stung to death by the first hatched young queen, when the workers decide that the rest are not wanted. It is remarkable that the first rivals to be so destroyed are those which are nearest maturity, although all cells are alike sealed up.

On the fifteenth to sixteenth day from the laying of the egg the perfect female, or a bee destined to be the mother of tens of thousands, emerges from the cell, though she is not fulfilling her destiny, until being established at the head of the old colony or one or other of the after swarms, she mates with a drone when about six days old, and on the

second day after begins to deposit eggs in the worker cells only. Contrary to the opinion of some writers, who affirm that a young queen is incapable of producing drones the first year, I have repeatedly had cases in *prosperous* colonies where a queen not two months old produced drones. Nevertheless, it is the rule for after swarms, having young queens, to build only worker cells the first season, hence no drones can be produced, and this would account for the erroneous conclusion arrived at by the old writers. Of course there is a lesson to be learnt at this point: "When wishing to obtain worker combs without the aid of comb foundation, insert young queens at the head of those stocks used for the purpose." But we have to note the

Condition of a colony nearing the swarming point,

and therefore must return to the period when the queen cells are being capped over. The old queen shows signs of restlessness, and were she permitted would perhaps destroy the inmates of the Royal cells, though only a few days previously she needed but little persuasion on the part of the workers to deposit the eggs in those very cells, soon to become her own rivals and deadly enemies of each other.* It is not always the case, but it sometimes happens that the bees cease to stimulate the old queen to egg-laying at this stage, and hence she is better able to fly, as her ovaries are much reduced in size.

The bees have not always time to finish capping all the queen cells started ere the excitement culminates in the issue of the first swarm, the old queen coming with them,

* The old queen is not so likely to injure maturing queen-cells as a young queen recently hatched. The latter can both tear open the cell and quickly despatch the inmate without aid, but in many cases the workers will assist her.

seldom first or last, but generally when half of the bees are on the wing. Bees of all ages come out, including those but just emerged from the cell. If the weather is warm, even these soon gain sufficient strength to fly and settle with the swarm; otherwise, if they cannot crawl back to the hive, many will perish; thus showing the necessity of a wide board reaching from the ground to the entrance, not only in this instance, but at all times, as many adult bees are lost in failing to reach the entrance during chilly weather. The workers out in the fields at the time of swarming and the large numbers of young hatching, soon make up the strength of the hive and prevent the remaining brood getting chilled.

Securing the Swarm.

If the apiary be located near high trees the swarms (if permitted to issue) will sometimes give trouble by clustering in them; though they may as often settle upon any low shrub, or even a post or wall. In the former case a straw skep must be carried up and the bees shaken into it when inverted under the clustering mass; descend the ladder as rapidly as possible, keeping the skep the same way, and then turn it the right way up on to a sheet previously spread upon the ground, with a brick or piece of wood under it, so that one edge of the hive may be raised to enable the flying bees to draw in.* Where the cluster is formed on a wall or any other like place, brush the bees off into the skep with a wing; but if among branches of wall trees, little can be done in that way, and they must be driven up into the skep as it is fastened above them, by the use of smoke; or, better still, make everything more

* Sometimes the bough may be sawn partly through near the junction with the trunk of the tree, so that it may slowly descend, and the swarm be more easily secured.

certain by first capturing the queen and secure her in a cage fastened under the edge of the skep when placed on the ground: in this case if only a handful of bees can first be brushed into the skep, all the rest will follow. On no account, in any instance, expect the bees will go up of their own accord into a hive placed above the cluster; it will only cause waste of time and disappointment; it has to be done, therefore carry the thing through at once. Many bees will continue to return to the clustering place, unless it is well damped with water.

Hatching of the Young Queens.

In about nine days from the issue of the first swarm, one of the young queens bites her way out of the cell, leaving the cap hanging attached at a part of its edge; this covering will sometimes get back into the original place and be again sealed by the bees, and should a worker be in, clearing out the residue of food at the time, its fate is sealed in a double sense. Such occurrences, simple to a careful observer, have at times given rise to unfounded theories; but at the same time it shows how it is quite possible to leave a useless queen cell in the hive when cutting out all but one to prevent after-swarming; a wanton waste of time, by the way, which cannot be tolerated in a modern apiary.

The young queens may be ready to hatch, they may even bite all round the covering of their cells, and yet not be allowed to leave them, should the weather be unsuitable for swarming, so that when the favorable moment comes several leave their cradles at the same time, and are quite ready for flight, but as a rule the first hatched young queen leads off, or rather goes with the second swarm; though the after, and sometimes even the second swarm, is accompanied by more than one virgin queen. Though

I am well aware that such queens will, if placed together, immediately fight until one receives its instantaneous death wound; when several accompany a swarm, or in case two or more swarms settle together, each having a fertile queen, the bees themselves settle the matter by "balling" those not required. After the hive is so weakened that the bees know it is useless to attempt to swarm again, or should the weather be unfavorable, the queens still unborn are destroyed, as I have reason to believe, by the workers tearing open the side of the cells and there stinging their helpless victims, or tearing them out piecemeal.

Young Queens Piping.

This peculiar sound will always be heard during a day or so before the issue of the second swarm. The sound appears to be an answering call or challenge from one young queen to another, and strange though it may seem, if the colony is still populous, several of these young queens may be running about the combs at the same time without harming each other. But this sound or call has a magnetic influence over the workers, who appear spell-bound, themselves being held motionless and flattened on the combs, in imitation of the queen's own action and attitude, while piping. This I have repeatedly noticed while holding the comb in my hand.

Within seven days after the issue of the first swarm there are no more uncapped larvæ, and therefore no more feeding required from the nurse bees until the last remaining queen is laying, a period of some 20 days, so that if excessive swarming is not indulged in, stores continue to accumulate while there is a reduced force to gather it. It is well that this is so, as the young queen is generally so very prolific that unless the workers can get in advance of

her requirements at the start, they are liable to reach winter with no stores on hand.

I have here shown in a general way the natural condition of a swarm during one year of its existence, but under modern management the state of things would be much altered ; at the same time I hope the foregoing will enable the uninitiated reader the better to understand and follow such methods as will hereafter be described.

The Sense of Touch and Communication.

How do bees work in the dark ? How does each home-coming worker find the cells used for storing the newly-gathered pollen around the margin of the brood nest ; or the new honey in cells still farther from the slight ray of light given by the comparatively small entrance, and where thousands of laborers are moulding fresh waxen cells to receive the rapidly incoming store ? And how do they find the eggs, the just hatched larvæ, or those nearly ready for sealing over—each requiring little or more food in proportion to age ? Do they continually appear to be looking into each cell out of mere idle curiosity ? Certainly not ; everything is done systematically, and with intelligent purpose, just as the queen mother will investigate every cell before she will deposit an egg therein.

How do they build the marvellous waxen cells, in hexagonal shape, or at all ; and how do they know when to cap them if in semi-darkness ? How do they know an enemy at the entrance, even in the darkness, while immediately recognising a friend ? The answer is that they know all, and do all of these things by the one sense of touch, by the aid of those wonderful feelers, or antennæ.

A worker on guard at the entrance will often rush towards another just alighting ; they cross feelers, and in

an instant the unspoken pass-word is given, and they know each other as denizens of the same home. Their antennæ are their eyes in all internal work, in constructing their combs, shaping those wonderfully delicate cells, it may be worker size, or drone size, or the occasional queen cells; in feeding their young, worker larvæ, drone, and queen larvæ; each with distinctive food for a definite sexual purpose or limitation.

The Antennæ

are the outward and visible signs of the bee's individuality —of its every sense of being. As the brain controls all the actions of the body, so these little apparently simple feelers convey every sense of touch to the brain. Without them even the power of sight is of no avail, and conveys no knowledge of direction or locality to the brain of the otherwise unerring insect.

In nearly all animated beings the brain is the essential illuminator of life; but in the bee that vastly important generator of the electric spark of motion is subservient to the outer senses, as conveyed by the antennæ.

Removal of the Queen's Antennæ.

If we remove a queen's antennæ, the poor insect immediately loses all sense of her economic duties. She no longer solicits food from the workers, indeed, they know her no more, and she is to them hardly more than a common fly. The unfortunate insect forgets to deposit her eggs, for a queen in normal condition never lays an egg in a cell without first inserting her head, and by the aid of her antennæ making sure the compartment is fit to receive it. She no longer stays on the combs nor regards the hive as her home; nor that thousands had relied upon her as the mother of their race; nay, she forgets that she needs a home, and crawls forth from the hive, away from

the busy hum of the multitude, like some miserably degraded being, she knows not nor cares not whither.

The Case of the Worker.

If we should be so callous as to continue the process, and remove a worker's feelers, we should find that she will forget all her various duties. She will not help to feed the young, will even forget to feed herself; she will gather no more honey, and will help to build no more waxen cells; she will not even be aware she has a weapon of offence; and like an outcast, knowing no friends, she will wander helplessly beyond the shelter and luxuries of the hive.

The Case of the Drone.

The drone treated in like manner will never seek a mate, he will neglect to prey upon the golden stores that he never helped to gather, and will not even solicit food from the workers. He, too, like the more useful members of the hive, when thus maltreated, will blunder forth never to return.

The Sex of Eggs.

It may be mentioned that occasionally a neuter or worker, or several of them, will, in the absence of a fertile queen, take up the business of depositing eggs. Among some varieties, such as Cyprians and Syrians, this peculiarity is noticed at times even while a fertile queen is in the hive.

The normal queen, as a rule, deposits only one egg in a cell; the laying worker, however, while very rarely doing likewise, will usually place numerous eggs in each cell over a limited space. These, or rather one in each cell, as ultimately left by the nurse bees, result in useless, or non-virile males.

It also occasionally happens that a virgin queen fails to

mate within a reasonable time, when she likewise can only produce males, whether she does mate with a drone or not; and certain it is many of these queens, though delayed in the act, do mate, and then commence to deposit eggs within three days thereafter, as is the case with the properly fertilised queen.

Non-Virile Drones.

The majority of prominent bee-keepers assume that the males produced by laying workers and non-fertilised queens are the same in every respect as those reared from the eggs of a fully impregnated queen. In other words, they assure us that drones from any non-impregnated mother are virile in every sense of the word.

This is a most erroneous assumption, that should not be advanced by any thoughtful and observant bee-keeper. Now listen! *Not one of these mistaken, non-observant apiarists would pay an average price, nor, indeed, would he pay any sum for, nor accept as a properly fertilised queen, one that he was assured had been mated to a drone bred from a laying worker, or from a drone-breeding unfertilised queen.* Hence our disbelieving friends expose their weak point, and their reasoning tumbles into dust.

No self-respecting queen-breeder would send out queens mated to such non-virile drones, as his business would soon be ruined, and deservedly so.

Queens, Neuters and Virile Drones.

A normally fecundated queen will deposit eggs which produce either queens (perfect females), neuters (undeveloped females or workers), or virile drones (males).

These eggs are all either fertilised or tainted by the action of the recent or final sire who mated with the queen producing them; and the fully fertilised mother can produce none other but fertilised eggs.

We have seen that eggs deposited in worker cells by such perfected queens, are fed to produce neuters, those in queen cell cups to result in fully developed virgin queens, and those in drone cells to become males. There is no alteration in the fertilising germs attached to the eggs intended to become workers or queens, but in the case of those in drone cells it is interesting to note that

Workers have the means of removing the germs

as when first deposited by the queen ; thus normal males are the result of a very simple manipulation. I have repeatedly experienced this truth when preparing worker combs for queen-rearing purposes. The half of the comb given to the queenless bees, though containing only worker eggs, soon gave evidence of carrying workers, queens, ***and drones***, at a date too early for any possible fertile worker eggs to result in drones. The other half of the same comb retained with the fertile queen had no drones in evidence.

Drone Eggs exchanged for Worker Eggs.

Since my own observations were carried out a German bee-keeper, named Dickel, has traversed similar ground, and on one occasion he removed a portion of the eggs from a drone comb, replacing them by worker eggs of another variety, when, instead of workers, the bees had so manipulated the inserted eggs that drones of the same variety (as the alien eggs) resulted.

Fertilised Queens Deposit no Untainted Eggs.

Repeatedly has it been stated that eggs laid in drone cells have no spermatozoa or germ attached, and therefore they must be unfertilised or non-impregnated. This is another of those amazing assumptions founded upon inde-

finite or crude experiment. *The investigator was too late, the workers had been before him.*

But apart from the actual germ, no queen can mate without her whole system being changed. The germs received at copulation are naturally carried in a fluid medium, which is largely absorbed into her system while the spermatozoa are being slowly directed (over the course of an hour or more) to their permanent location, the germ sac, at one side of the oviduct.

Because these germs are ultimately located in one compartment, it is erroneously considered they are consequently isolated from any contact with the rest of the queen's system. It has been generally taught that the queen is able to fertilise all eggs intended to become workers or queens, and that she is equally able to withhold the germs when depositing eggs in drone cells.

The same theorists overlook the fact that the ovaries of the queen, because of the fluid injection and absorption, can never again be in the original virgin state. They would also consider, or so their method of reasoning demonstrates, that the spermatozoa are so many dry shot, or hard peas, when once locked away in the sperm sac; entirely ignoring the fact that they are a living, perpetually writhing mass, that must have continual sustenance from the queen's body.

If this active mass must exist by drawing upon secretions expressly prepared for its use in maintaining the utmost vitality, then is it a fact that there can be no flow without a return; and these germs cannot live within without affecting the whole of the queen's system.

There are, then, three distinct points referring to the inevitable taint of the drone progeny of a fertile queen. First, the unavoidable mingling of serum at mating; secondly, the change in the queen's nature by carrying the spermatozoa that may not be locked away from her general

system like some inert or dead thing; and lastly, her eggs will not produce males unless at the will of her attendant workers.

Finally, in the event of accident or exhaustion, the drones she may produce are still of two natures, because of the first point set out, as also are those from the drone breeding queen that may have been mated too late to be fully impregnated.

The Author has many times proved in results attained, that of a number of daughters bred from a pure and correctly mated queen, the said daughters would produce hybrid drones if themselves mating with dark males.

Furthermore, a daughter of a first cross queen, if mated to a pure yellow drone, will tend to produce more evenly colored drones. At the same time, another daughter of such (first cross), if mating a dark drone, will have nearly black drones.

Finally, no drones from a mis-mated yellow queen can be responsible for producing equally yellow workers as those of the original strain.

There is as much variation in the honey gathering qualities of different races of bees as there is in the milking characteristics of distinct types of dairy cattle. But there is also a vast difference in the output of colonies of bees of the same race ; and it is solely by selection in breeding from the best, or by purchasing from the best known strains, that the highest success can be assured.

CHAPTER IV.

VARIETIES OF BEES.

THEIR CHARACTER AND DISPOSITION.

FROM time to time, throughout a lengthened experience, the Author has seen various foreign races of bees tried and discarded after a short period of popularity. Someone had found "something fresh" that somebody else had tried and discarded many years before.

In this list will be found North African bees, Caucassians and Banats of similar derivation, Carniolans, Goldens, Cyprians and Syrians ; none of which appear to be superior to the Ligurian varieties for general purposes.

In the United States the Italian or Ligurian bee is almost universally adopted, and the bee-keepers of that vast range of honey producing States nearly always come back to this variety as the most reliable, for all purposes of profit, and because of their amiable disposition.

In Great Britain opinion is divided about equally over the choice of Italians and so-called natives, which latter now largely owe their superiority to the constant infusion of Italian blood all over the land.

THE BLACK, OR NATIVE BEES,

are still cultivated in many apiaries; their newly-stored combs are beautifully white, and therefore comb-honey produced by them commands a good sale. They are not so prolific as other races, and hence do not give as much surplus, and consequently are of little use in an apiary where increase is desired; indeed, I can assert as a fact, the bee-keeper who expects to build up a large and prosperous apiary from black bees alone, will be certainly disappointed. Among others I knew of a prominent bee-keeper who was going to build up a large apiary of native bees because he was certain there was no better kind. His expectations have been dashed to the ground, and now he proposes to rely on "foreign" admixture, which he already finds superior to natives. It will be found more profitable to introduce some foreign blood, both for ensuring larger yields and because of the added vitality, helping to avoid disease.

To Perpetuate their Working Qualities,

I have found it necessary to breed from a queen of the native kind, crossing with a yellow drone; the act of crossing in itself adds greater energy; while the disposition is received from the male side. For instance, a queen of a mild strain mating with a drone from a vicious colony throws workers which almost invariably turn out to be irritable. Again, I have had queens produce workers that the average bee-keeper would not attempt to manipulate under any kind of intimidation; and yet the daughters of such queens allowed to mate only with drones from stocks known to be easily handled, have given workers that one could do anything with.

I have found many black bees more irritable than any I have ever had, even rushing from the hive to attack a

person many yards off; but by crossing the queens with Ligurian, or Carniolan drones, this disposition is corrected. It has been considered that hybrids are very vicious, but this is only half true; what I have stated above is strictly in accordance with fact, but when a yellow queen of some varieties is allowed to mate with a black drone, then, of course, the progeny resulting therefrom will be irritable, while their working qualities will be inferior to those of the cross recommended. Black drones are not required in breeding up a new strain, and should be rigorously excluded.

Native Bees and Disease.

Although I have shown these bees have some good qualities, nothing is so disheartening to the experienced bee-master than to see a bee-keeper clinging to native bees in a neighbourhood where foul brood, or the Isle of Wight disease, may be prevalent, and where he is, therefore, constantly subject to these complaints, and is always destroying good material, with no hope of ultimate profit.

Natives have several faults, apart from a rather bad temper. They are not sufficiently prolific, and do not store so late in the season as do Italians. But beyond all, they are helpless in the face of disease, and will not work with their owner when he attempts to cure the malady.

Native bees rarely recover from brood diseases, and it has been noticed that nearly all apiaries lost by the Isle of Wight disease consisted of natives.

LIGURIAN, OR ITALIAN BEES.

These were the first yellow race introduced, and though much abused in some quarters, they have gradually gained ground until there is perhaps hardly a district where the

native bees have not to some extent, more or less remote, received some benefit by the infusion of fresh blood. Indeed, it is amusing to hear some apiarists assert that Italians are inferior to the old-fashioned sort, and that they will have no more of them; when, as a matter of fact, their original stock has been greatly improved by the introduction of the foreigners, short though their existence may have been; and, moreover, the probability is great that year after year such short-sighted men are indebted to some distant bee-keeper for the continued excellence of their blacks (?); as the new blood is carried from one apiary to another, through successive stages during succeeding seasons; each cross showing less of colour, until in the end there is scarcely any evidence to show that the dark bees of the neighbourhood have foreign blood in their constitution.

The advantages claimed for Ligurians are as follows: They are more prolific, and consequently gather more honey than blacks, more especially as they can work upon some flowers not accessible to the others, and continue to gather until Autumn is well advanced. Strange to say, natives often do best early in the season, but in Autumn I have known Italians draw out foundation rapidly and store heavily, while at the same time the former would not attempt to work upon a sheet of foundation placed in the centre of the brood nest. The Italians are more gentle, and together with their beautiful markings, this has done much to make them popular.

I do not by any means recommend Italians generally; and during a period of some 40 years that I have imported them I have only found one or two strains of really high-class honey gatherers. These can be still further improved by a process of careful selection.

As with all yellow races, Ligurian workers have three

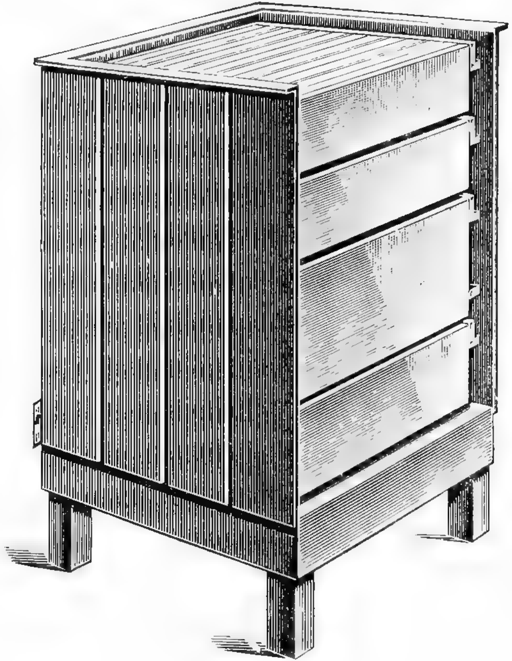


Fig. 5.

The Single "Conqueror" Hive, having the stock chamber and three supers of divided sections and frames. Shown with cover and back removed.

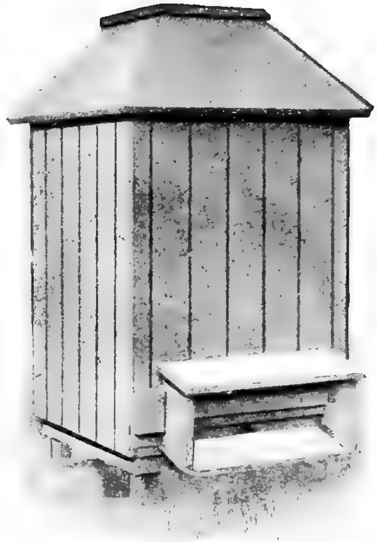


Fig. 6.

Front view of Single "Conqueror," with cover.

yellow bands on the upper part of the abdomen, beginning at the first segment. Creamy white lines of hair follow the broader yellow bars, down to the extremity of the body, giving the bee a handsome appearance. The queens vary in colour from dark to light yellow ; while the drones sometimes have patches of yellow on the abdomen, and others are hardly to be distinguished from those of the black kind.

Italians and Light Honey.

A notable feature in connection with these bees, is a fact which I have noticed for many years. While common bees may be gathering honey-dew or other dark honeys, these bees are at the same period producing honey of the clearest whiteness. They evidently are able to work on flowers which the natives are unable to make use of.

GOLDEN ITALIANS.

In this and other countries there has arisen a demand for golden queens and bees. To a large extent queen-breeders have been responsible for this demand, vieing with each other in producing the most yellow strain at the expense of general utility.

Many of the golden queens produce bees that are unable to secure any surplus, and will hardly support themselves in the finest weather. They are flimsy and delicate, often dwindling rapidly in Spring, when they should be building up to strong colonies.

These bees have done a great deal of harm to honey producers who have been unwise enough to throw away their money on them, and at the same time cut off any profit they may have hoped for from their apiaries.

One may certainly have yellow queens which produce workers with definite yellow bands, and yet have a good honey getting strain ; but if one goes farther, and desires

workers yellow all over, then he is looking for something quite useless.

When hybridised, the golden queens mating with dark drones, then some improvement is found in the working qualities, but the temper of the workers is not very desirable.

CARNIOLANS.

While Carniolans are not quite such good honey gatherers as some others, few can compete with them for colour of comb-honey. It has been stated that they swarm immoderately, and this is where they have failed in public estimation. There is one thing, however, which would give that impression; the demand for imported queens has been so great that I am afraid many old queens have been sent over, more especially as few of the native holders make any attempt to raise queens for the market. Therefore, in the natural order of things, the old mothers would be superseded, and a number of swarms come forth headed by young queens. Where old queens are avoided there is less trouble with these bees in that direction.

They are so very prolific that considerable attention is required just at the critical time, in giving plenty of room, and free access to all parts of the hive.

One great point in their favour is their good temper. Without smoke, or other intimidants, hive after hive can generally be opened, and no stings are received.

Carniolans are active * during the summer months, and yet are restful when confined during winter; in fact, they come from a cold mountainous region, and there is,

* Somehow their activity never seems to result in the accumulation of a proportionate amount of stores, unless they are hybridised, and then not only is their temper somewhat vicious, but they become chronic robbers.

therefore, no doubt either as to their energy or good wintering qualities.

There has been a tendency to regard Carniolans as free from disease or having but a slight tendency in that direction ; but although the Author has sent out queens of this race that have given remarkable records in the midst of diseased apiaries, he does not regard them as proof against all diseases.

The queens vary in colour from yellow to black ; some being "ringed," the colour of the abdomen shading alternately from light to dark, but all produce workers of the typical sort, having on the abdomen near the thorax a mere shade of bronzed yellow, and then follow several extremely broad white bands, giving the bees an attractive appearance.

Many of the queens imported throw workers having one or two distinct bands of yellow, which shows that either the native bee-keepers have introduced some of the yellow kinds, or that the ancient admixture of yellow blood is still strongly in evidence.

CYPRIANS.

Among the yellow races these were at one time expected to take the front rank. Though not suitable for the production of comb-honey, they are active and extremely docile, except in the cool season, while their great beauty is undeniable. They have three yellow bands on the abdomen, followed by broad bars of light yellow hair. Unlike Ligurians, the yellow extends to the under-side of the body, as it does also in a less degree with Syrians. The body is much smaller than that of the native variety, tapering to a fine point, quite unlike the more rounded form of the other.

After an extensive experience, however, this variety was

largely discarded, as their faults far out-balanced their virtues. Hybrids * from these are more vicious than any, while both the pure race and the hybrids have a very bad habit of starting fertile workers, either with or without a queen. This is a serious matter in any queen-rearing apiary.

Another disadvantage is the fact that they will not usually seal their stores when fed up before winter; and comb honey, when capped by them in summer, has a dark and watery appearance.

There is reason to suppose that some of the imported Italian queens have been crossed with Cyprian drones, as these will sometimes produce workers having all the vices of that strain, such as the frequency of fertile workers, watery cappings to their comb honey, and the excessive use of propolis. Pure Italians should not have these faults, being the result of using Cyprian drones. If, however, the apiarist has the opportunity of ensuring the mating of Cyprian queens with Italian drones of the leather colored strain, he will find these troubles less in evidence, while the temper of the resulting workers will leave nothing to be desired.

If there is any race almost proof against disease, or that can quickly overcome these troubles, it will be found in Cyprians. The first cross with pure Ligurian or pure Carniolan drones will be found hard-working, gentle and prolific. They will also be long-lived and largely free from disease, even though it be chronic in the neighbourhood.

Cyprians have been credited with producing the enormous quantity of 1,000 lbs. of honey from a single colony in a single season. While it is known that Cyprians are among the most active in flight, and possess

* By hybrids, it is generally understood as a term applied to the workers produced when natives and any foreign race intermix.

the desirable quality of longevity, the pure race cannot be relied upon for heavy yields; hence the bees responsible for this large result were probably crossed with another variety.

I knew a case a few years since where a stock of bees, a cross between Italians and Cyprians, yielded over 350 lbs. to one colony in a favorable district. Those who cannot rely upon their young queens mating to Italian or Carniolan drones should hesitate to introduce pure Cyprians into their apiaries.

SYRIANS.

These are, in appearance, much like the foregoing, though of a darker shade, and sometimes are not so well marked as Ligurians, though always yellow on the underside of the abdomen. Instead of having cream-coloured bands of hair like Cyprians, these have corresponding bars of a bluish white colour, much like the Albinos supposed to have been bred from an off-shoot of the Ligurian variety; while some condemn Syrians as utterly unmanageable, others claim that they have many valuable qualities.

I have found among them queens producing workers almost unmanageable, while a larger number gave bees that could be handled like flies.

PALESTINES.

These are, perhaps, more yellow and beautiful than Cyprians, but can hardly be recommended, as they develop fertile workers to a greater extent, use more propolis than any others yet named, and while being handled have a very disagreeable habit of biting the fingers. These have often been confused with Syrians, but the two are quite distinct: Palestines come from the Holy Land proper, while the others are found farther north, in the Lebanon

mountains. Successful results have been secured from a large apiary of these bees, in their native country, by Mr. Baldensperger, in Jaffa. Their temper is very disagreeable at all times.

Other Varieties

have been brought forward from time to time, including the South African, Caucassian, Minorcan, and Punic or Tunisian. The first named are merely hybrids varying (in the same colony) from three yellow bands to almost black in colour, with the usual lighter bars of whitish hair between each segment of the body, in this case of a peculiar ashen-white colour. The queens are almost black, while the workers are smaller than those of any other race cultivated. A number of undesirable traits, apart from being hybrids, prevented their general introduction.*

The Minorcans were freely offered for sale in this country, but these again, though similar to our native race, had no merit of sufficient value to claim the attention of practical bee-keepers, and hence gained no favour.

The Tunisian is another of the darker varieties which, however, at one time came in for some notoriety, but the race has been proved inferior to our native variety.

The novice should be careful about investing in new varieties of bees, unless he can see some tangible evidence of superiority after careful trial, or he is convinced by independent testimony that he is running no risks in changing his stock.

---

* This opinion was gathered from the Author's personal experience with this variety, imported from a prominent South African bee-keeper some 30 years ago. Since this time many Italians have been used in the colony, so that the darker shade of the workers has been largely obliterated, and a more uniform type of bee is the result in a few districts.

The apiarist must not be content with bees of average or less than average quality, as too frequently happens. The usual yield is from 25 lbs. to 30 lbs. of surplus, and yet it is possible, by careful selection in breeding, to secure an average exceeding 100 lbs. per hive.

CHAPTER V.

HOW TO OBTAIN GOOD WORKING STOCK.

IN most apiaries it is found that a certain colony, or perhaps a few stocks, surpass all the rest in the amount of honey collected ; and the remark is often made that of two colonies standing side by side, apparently equal in every respect, one gave a large surplus while the other did almost nothing. Reader, let us reason together, and see if it be not possible to explain the apparent mystery. As a matter of fact

The Whole Secret of Successful Honey Production

consists in always maintaining the proper proportion of adult working bees in relation to the quantity of brood and young bees on hand. Here, then, can be discerned the difference. One colony was so favorably constituted that the queen was able to produce the full working force *before* the honey flow came on ; while the other could not breed to her fullest capacity until *after* the season commenced. In the latter case the working force is unable to do much more than keep the rapidly increasing brood nest and large population of young bees supplied.

The colony which gained the proper balance of population at an early date, on the contrary, has the larger proportion

of adult workers. This is the hive which will give the heavy surplus, and the other can never compete with it, even though it has twice the population. Of course excessive (too late) breeding can be to a certain extent modified by contracting the size of the brood nest, but nevertheless the actual hardy working force will not be in excess until the season is far advanced.

We must now consider the causes of such a wide difference. They are many, one of the first being that the queen may be stimulated to breed too late in the autumn; consequently she will be late to begin breeding the following season. The hive may have been short of stores, or the combs so overloaded in early spring that there was really no chance for the bees to develop the brood nest. Perhaps they were thrown back by being too much exposed, instead of having warm material above them. In either case an early hatching of young bees would be out of the question; and these are the mainstay, compensating for the loss of many veterans when frequent flights become necessary. Consequently the best powers of the queen are not expended before the season opens.

To obtain good Stock,

it is absolutely necessary that one keep only the very best queens—young, highly prolific and well developed. When I mention young, I mean just what I say. How wasteful and unnecessary! you say; but I assert as a fact that to enable one to keep his stock *generally* in the highest state of efficiency, he must retain no queens that have seen their second summer. Take a queen raised even so late as August; she will be in full profit the following season: keep her till another season and her colony will be hardly second-rate. This is, of course, if the owner knows how to use her powers.

To be prolific a queen must not simply keep pace with her workers while building up in preparation for the season, but must actually force them to make room for her. Such queens are to be had, and with them no "brood spreading" by the apiarist is necessary. A well-developed queen is more hardy and energetic than a smaller one; and, as a rule, will get mated in risky weather when twenty inferior queens fail to meet a drone.

The finest queens are obtained from young mothers. A queen is in her highest state of excellence soon after she commences to lay, and can be used for breeding other queens, if from stock of known excellence, as soon as it is found by her hatching bees that she has mated correctly.

Queens cannot be too Prolific.

I am aware that there are some bee-keepers who consider that a queen can be too prolific. It may be so with their management, but as a simple matter of fact the more prolific the queen, the larger the surplus stored, *but* one's management must provide that she does her best before the season opens; thereafter she will simply keep pace with the wear and tear upon the life of the workers.

It will be asked, "And how are we to provide that the best powers of the queen are to be used up before actual storage commences?" Some important matters having reference thereto I have already given; but one way of doing this is to unite two or more colonies, making them very strong in the Autumn whenever it is found stocks are at all under full strength. Another plan is that of uniting about ten days before the season is expected to open, and thus in either case providing that the number of actual gatherers shall presently be far in excess of those required to attend to the young.

As a rule, especially where no honey is obtained after

July, the best results are secured by preventing the issue of swarms, unless obtained from three to four weeks before the first honey flow is usually expected; but nevertheless, unless

The Equivalent of Swarming

is allowed, our stock must deteriorate as a natural consequence. Therefore select one out of every 10 colonies and devote it to queen-raising (see chapter on same), and allow one nucleus with a young queen to stand by the side of every stock. By the Autumn such nuclei will have themselves become fairly strong, when the old queens can be destroyed and the two lots respectively united in the evening of the following day.

Having studied the general rules to be observed if we wish to have only good working stock, we must now consider which are the

Most Suitable Bees

for our purpose, whether we intend to work them for comb or extracted honey.

The advantages to be derived from the foreign varieties can hardly be over-estimated, for by crossing with queens of the native kind, we get greater fecundity, and better honey-gathering powers than either pure race possesses. In the former chapter I have already shown that a black queen may form the basis from which to build up a good working strain. Select such queen of known excellence, and for the production of comb-honey use Italian or Carniolan drones to mate with young ones raised from her; the first cross being the most suitable.

For extracted honey a good Italian strain will be found to give the best results. Pure black bees are not at all desirable for either purpose, as they cease storing quite a month sooner than the foreign varieties or hybrids; more-

over, they are frequently troubled with the wax moth, while the latter never are. Let it be observed that black (native) drones are to be rigorously excluded, as these give bad-tempered workers when crossed with a queen of either of the foreign varieties.

In concluding this chapter, I must insist that unrestricted or indiscriminate swarming, as hitherto generally practised, *is totally at variance with all true principles of breeding.* To obtain the best results, it is absolutely necessary that all queens be carefully bred from the best stock only, and in a direct line from both queen and drone mother.

Unrestricted or indiscriminate swarming, as hitherto generally practised, and the use of drones and queens from many different mothers in the same apiary, are non-progressive practices, absolutely at variance with all true principles of breeding.

CHAPTER VI.

BREEDING PEDIGREE STOCK IN DIRECT LINE.

DRONE-MOTHERS SELECTED AND REGISTERED AS WELL AS QUEEN-MOTHERS.

IN aiming to obtain the highest possible results as regards quantity and quality of produce, it is absolutely necessary that all queens be carefully bred in a definite line from the best stock only; selecting not only the queen-mother, but the drone parent also, in the manner carried out by the Author for many years, and here fully explained for the first time.

Where the apiarist allows natural swarming, or saves swarming queens from any stock that has queen-cells handy, he is always crossing and re-crossing his previous land-marks—if he ever had any. He is like a ship without a rudder, swaying here and there just as the wind likes to carry him. He is as often going backward as forward, and can never fix upon a definite line of breeding.

And yet some of the most prominent bee-keepers will say there is no way of securing a fixed type, or fixed qualities in any strain of bees without isolation of the breeding stock on some island, or a spot where no other bees are known for a radius of ten miles or so.

Nevertheless, I have been trying for many years to show that any intelligent apiarist may isolate his own apiary; he may isolate his own breeding stock without any unusual expense, and yet be able to mate his queens exactly as he wills; while his selected drones will be so much stronger on the wing that odd drones from neighbouring apiaries will have no chance in the pursuit of his virgin queens.

It is a very bad practice to allow drones to be produced indiscriminately in the apiary, as it is also to save any or all of the swarming queen cells the owner may find in various stocks.

Perhaps he will say he saves only from several of his best. But that is not a sufficiently restricted line, as the several will never help him on the straight road to secure the best possible stock. The several allow for too many turnings; he cannot follow them all without presently going astray.

One Queen—One Season.

Don't forget that point; there must be a selection of one queen only for the one season. One mother for drones and one mother for queens; and the one for drones must, if there is any difference, be the best of the two when starting.

This is the method of isolation: there must be no other queens reared in securing breeding stock, and absolutely no other drones allowed to fly.

Where the owner is well acquainted with the nature and color of his stock, he will know if his queens mate with his choice drones. If he only secures a small proportion mated as he wishes the first season, he has enough for a good selection the next year

For the following Season's Drones.

He will then be able to select four to six *daughters of the*

previous year's queen breeder, using these for swamping the locality with drones.

He will still use but one mother, not that of the former year, but a selected one from his own stock, or a tested queen purchased from a good strain, as the parent of his second year queens.

Thus every year the apiarist will select a fresh extra tested queen for his current queen-breeder, and every following year he will use his previous year's queen-breeder, or her selected daughters, for providing his drones. Thus:

The mother of queens one year is the parent or grand-parent of drones the following year.

In this way the owner is going straight ahead all the time through the one selected queen each season, with his drones following in the same line, so that he never loses any new blood he may select, or bring into the apiary. He is building up all the time, and whether he occasionally buys a high-class breeder for any year, or may pick out some extraordinary queen already in his earlier line of breeding, he is getting full value, and is never looking back or jumping off the track.

These selected direct-line queens, on both drone and queen sides, must of course be named, lettered or numbered, and a careful register maintained; but it is useless to endeavour to name or register those not selected for breeding.

One cannot keep in line with a lot of different queens each year; he is sure to come to grief in attempting it; though of course two or three may be held in reserve in case of accident to one selected for the season.

The foregoing is the method of breeding the Author has been carrying out for many years, and an outline of the

plan was first given in the *American Bee-Keeper* a few months before that journal ended its useful career.

Sometimes a fresh strain, resulting from an imported queen, with her descendants successively mated to the selected drones, is kept under observation for five years or more before a selection is made. It is only when a queen is first used as the breeder for the season that she is registered, although of course notes and observations are made in the meantime.

I have shown the necessity of making a definite selection, and we have now to consider

What constitutes a Good Queen.

The reader should set up a Standard of Proficiency, and then strive his utmost to work up to it. He may not do just so well as he would like to, but he will be all the better, and will succeed better for trying to reach the goal in front of him.

Without a good queen presiding in every colony our best plans are likely to go astray. She is the one essential item of force behind all our manipulations.

Having procured good queens, and being assured we can rely upon them to perpetuate their superior qualities through each succeeding generation, we have yet to consider that the best queen going may be worn out by intensive management after one season of full work.

The bee-keeper who, under average conditions, secures his 50 lbs. or less yearly from each stock, is content to say his queens are good for at least three years. *But we must aim to have those three years' produce rolled into one.*

Instead of a queen that may maintain three-fourths of one set of combs occupied with brood, we require queens that will fill two or three sets of stock combs by the time the first honey-flow is in evidence, reducing to one set at

supering for comb honey,* but turning the removed force back as soon as the brood results in adult workers. No excluder bogies will be wanted under the supers with such colonies and properly selected queens, as they will crowd the supers with honey while average lots may be doing but little.

In this way a good queen that is willing to expend herself, may be relied upon for only one season, and we must prepare each season for another, uniting a young one and her nucleus to the old stock every Autumn, thus ensuring rapid spring breeding and ultimate prosperity.

There is the alternative of wintering the older queen, and changing to a young one when swarming without increase by the methods described herein. The reader should all the time bear in mind the great possibility of securing in one year as much as the average bee-keeper gets in three seasons, consequently the mere money value of a queen is trifling compared with such a profitable result.

Selecting Queens for Longevity.

It has been shown that for dividing early or for supering to the best advantage, one must have a young and unusually fertile queen with the colony. But she must be bred for other good qualities besides fertility. The strain must have, and should be eminently capable of transmitting, that stamina which ensures longevity; and this means first-class wintering capabilities, rapid building up in Spring, no dwindling, and consequently the development of enormous populations, and large yields of honey.

We are not anxious about keeping a queen over a year (unless it be as a selected breeder), but she must come from

---

* A natural and moderate reduction of brood will occur when all the chambers are left as in working for extracted honey.

such a strain as just mentioned. If we secure bees that average eight weeks during the busy season, instead of a life of six weeks, the difference in work done, and the accumulation of population, is readily realised.

Furthermore, if we get workers to live eight months through the dull winter period, instead of six months, we are gaining still more, and such stocks stand long winter confinement, while all the time the bees are found to be bright, slim and active.

Remember it is the queen behind every good quality we are striving for; and queens that produce these long-lived workers ensure for the owner nearly every good quality required in a high-class strain.

These bees are strong on the wing, and do not chill so readily during cool winds. They may not always be good tempered, but that is a trait very easily bred out, and bees good in every other respect should not be discarded for that trouble alone. Bees that are very gentle are not usually good honey gatherers, nor rapid comb builders, and are not so quickly shaken or brushed from the combs as more active workers.

There are several other good qualities not to be forgotten when selecting queens for first-class results; and in the case of comb-honey production these are: readiness of the workers to enter supers, rapid comb-building, white sealing of the combs, and perfect filling of the sections with regular and even attachments all round.

These desirable traits can be had with the most prolific of three-banded Italians if the bee-keeper will secure the best and breed solely by the methods of selection as previously explained. Great results can only follow great endeavor.

Where a bee-owner, adopting the pursuit as an important addition to his income, expects to make the best of his surroundings, he can only ensure the highest success as a honey producer, if he has sufficient land to enable him to grow large clover and other crops in the immediate vicinity of his apiary.

CHAPTER VII.

PLANTING FOR BEE-PASTURAGE, AND INCREASED PROFITS.

IN many localities the honey harvest is over by July; but on the South Downs throughout August the Dwarf Thistles in myriads keep the bees busy; while in the valleys lying between the hills, the second crops of Sanfoin are often of great value early in the same month. On the moors and hill sides of the North the heather helps the bees during August and early September.

In many parts of America heavy yields of honey are secured in Autumn from wild flowers; while in tropical and semi-tropical localities bees will often gather some honey all the year round.

Nine years out of ten we have a fine Autumn spell in the South of England after the usual flowers have succumbed; and the bees having nothing better to do, are in too many cases on the alert for the least chance to rob a neighbouring hive.

How often has the bee-keeper wished that such fine weather, so enjoyable a period, could be made a time of busy labour to his now idle thousands, so that they might take to the more pleasant paths of industry and good

behaviour. Oh! for the magician's wand, that flower laden fields might spring into existence and waft their honeyed odours to the still crowded hives. What a marvellous change should we behold! Instead of robbing, worrying and fighting—the industrious hum of roaring thousands—in place of shrinking stores, we shall see every open cell glistening with the golden nectar, and the winged multitudes darkening the air as they speed in shoals to and from the honeyed mine of flowers.

And yet, dear reader, this is all quite possible. Why should man sit down helplessly, and remain content with the shortcomings of his locality? 'Tis not Nature that is at fault, but man's own want of foresight and ingenuity. Do you expect to make bee-keeping a success on a large scale? Then there is only one way that will do it in this country. You *must* plant intelligently. By the acre? Aye! by the tens and hundreds! Then will you pile up half-a-dozen supers where now you have one. You will have little or no more Autumn feeding, and no more unpleasant robbing.

Estimate of Honey Yields per Acre.

It has been estimated that an acre of white clover yields some 10 lbs. of honey per day. Suppose we allow the ordinary local resources to support a medium number of stocks, say 100, and take only our specially planted fields for the surplus. We will plant say five successive crops each of 20 acres to yield 200 lbs. for one day. At 20 days each crop, that will be for 100 days 20,000 lbs. of honey from 100 acres, thus allowing 20 days only to each crop, without counting anything for second crops.

Less than 100 colonies would gather this from special clover crops close at hand, but we have to allow for the natural yields as well, and must not make the expenses

too small. The 20,000 lbs. at 6d. would work out at about £500.

And now the cost.

	£	s.	d.	£	s.	d.
Rent at £1 per acre will be	100	0	0			
20 lbs. seed per acre average 10d., and sowing, say	100	0	0			
Ploughing, rolling, &c.	100	0	0			
	300	0	0			
Profit				200	0	0
Hay,* 100 acres, say 100 tons at £3, equals	300	0	0			
Less haying, £1 per acre, £100 ... ... Less manure, £1 per acre, £100	200	0	0	100	0	0
Total, profit first year				£300	0	0

Now some of these crops would last several years after first cost of sowing, while the cost of cultivation would be almost nil for a time, and less manure would be required. Thus taking the second year we have

	£	s.	d.	£	s.	d.
Honey	500	0	0			
Rent	100	0	0			
Profit				400	0	0
Hay 100 acres—100 tons at £3, equals ...	300	0	0			
Less haying £100 Manure ... £100	200	0	0	100	0	0
Total, profit second year ...				£500	0	0

Now a month is a short period for some crops to be in flower. I shorten it to 20 days, allowing for cutting. But I have shown nothing for honey from the second crop of blossoms, nor yet for the second crop of hay, both of

* Hay is sometimes less than £3 per ton, but occasionally, after bad seasons, it would be nearly double that value. As these crops will consist of clover hay, the average value will be much above £3.

which many of the clovers will give in one season. But against this there may be a set-off in the fact that a part of the rotation of bee-crops may not be hayed at all, though in that case it would be such as remain in blossom for six or eight weeks at a time, while, of course, the yield of honey would be greater. Taking the whole matter into consideration, the estimate as to the profits from planting must appear very moderate indeed.

This is simply an estimate of the lowest possible profits to be secured where crops are sown for the use of 50 to 100 colonies of bees. But this quantity of ground could not be so cultivated without an additional profit to be secured from grazing and otherwise feeding cattle; a process which would largely increase the proceeds. An average of only one ton of hay to the acre is shown, but it is no uncommon thing to secure, as I have done myself, two tons from a first crop, and one ton from the second crop in one year.

Manuring the Ground.

Nevertheless, it will ever remain a prime factor that the ground must be moderately good to start with, and must be kept up in good condition, otherwise the bee-keeper's attempts to supplement his local resources will meet with grievous disappointment; just as any other tiller of the soil must fail utterly if he will not reward Nature's ever willing hand.

The Great Thing

with such planting is the broad fact that the crops are close at hand, and are brought into due rotation, so that often when the weather is not such as will entice the bees to distant crops, they will simply roar on fields almost adjoining the apiary. The best crops for honey will be our first great consideration, while at least two-thirds of

the area sown shall be utilised for hay, and sometimes as pasturage.

Quantity of Seed per Acre.

Good ground will require less seed per acre than poorer soil, for the simple reason that more seed will germinate where it is offered more nourishment; hence a wide margin is allowed.

White and Alsike clovers may be sown at the rate of 14 lbs. to 20 lbs. per acre; Melilot and Yellow Trefoil, 10 lbs. to 15 lbs.; Trifolium, 20 lbs. to 25 lbs.

Where two varieties are sown together, I should prefer not to halve the quantities, but to use about two-thirds of each. If three varieties are grown together, then say half the above quantities of each.

In ordinary seed leys these clovers are often sown with Rye or other grass, and usually in Spring, on land put down to corn the previous Autumn, or it may be earlier in the same season. Nevertheless, for the object we have in view, it is better to leave out grass seeds and corn, allowing Melilot to stand in the place of the corn, and sowing with it either one of the other varieties, or two of them where Yellow Trefoil is included.

The Earliest Field Crop (Plot No. 1)

is the yellow hop clover, but if sown alone, nothing will follow on the same ground after the June cutting. This starts with apple bloom and flowers continuously from early May until June, and the bees may have the benefit of the bulk of blossom before cutting. It makes sound feed and heavy crops of hay, and will at times realise about twice the value set out in my estimates.

But this miniature clover must be mixed with Alsike and Dutch, and may be sown any time from April until

VIEW OF THE HEATHFIELD APIARY, LOOKING TOWARDS THE ORCHARD.

September,* as the ground may be prepared, or at liberty. After the June cutting we get white and Alsike to follow—making nearly three months on the same ground, cutting the second time (Alsike and white only) early in August, giving probably three tons in all per acre, as against the one ton estimate. Alsike and white would follow for several years if the ground is generously treated. That is one plot of 20 acres, and now for

Plot No. 2.

The intermediate early crop will be the *Trifolium incarnatum*, flowering from the month of May until mid-June. Now if this is left for the bees it will not make the best of hay, so we will sow it in September with Melilot or sweet clover. We will then cut our Trifolium early in June, together with the not yet flowering Melilot, leaving the latter to flower from July until frost.

Now if the Melilot is cut when in full bloom, there is nothing to follow, and No. 2 plot is again empty, but before deciding upon this course we will consider

An Alternative.

As both the Trifolium and Melilot flower once and then die away, after the first cutting the Melilot may be allowed to stand and re-seed the ground as the seed ripens and falls. The stalks will then only do for litter.

The Trifolium may be sown again each Autumn, the seed being very cheap, and the plant readily established if sown in a showery time, not later than September 15th,† and then simply harrowed in and rolled well.

* This is for purposes of bee-forage; otherwise, clovers as farm crops are usually sown in Spring, *Trifolium incarnatum* excepted.

† While Trifolium should not be sown later than this date, for our purpose it must be sown soon after the crop is cut, before the Melilot again shoots up.

On the other hand, no cutting need be made on plot No. 2, leaving the *Trifolium* to re-seed itself, while not being cut the Melilot will flower earlier and the plants be very much stronger. They will, however, not continue flowering so late.

I should prefer to cut the first crop, unless, indeed, I had two similar plots, cutting one and not the other, so ensuring a better succession of the two most valuable of all honey plants.

Plot No. 3.

And what shall we do with this? This will be wholly white clover, and if cut three times in the year on very good ground, or say twice on the average, a very good succession will be got; but not a very heavy crop of hay, unless rye-grass be sown with it.

Plot No. 4.

This also shall be white clover, and is to be cut a fortnight after plot No. 3 on each occasion. There will then be an abundance of snowy white blossom, from the time the plant first bursts into fruitfulness until far into August.

Plot No. 5.

Now it must be remembered that very few cultivated plants will yield honey after the month of August is nearing its end, no matter how fair the weather may be. Consequently I must return to Melilot as being almost the only profitable bee-plant that will continue to yield honey far into the Autumn. This plot should be pastured a month later than plot No. 2, or if not so utilised, then cut a fortnight later only, as the plant will take longer to recover from cutting than if it had been fed off.

Other Crops.

There are some other plants which have been regarded

as very good for bees, and though they have no value for hay, it might be worth while to give them a trial. Thus we have mustard, which may be sown six to eight weeks before needed for flowering; but mustard for Autumn, like rape for the following Spring, should not be sown later than July.

Mustard is useful for sheep feeding, or for cleaning the ground and ploughing under when just in bloom. Rape is also used for folding sheep and then ploughed under; while as a feed for cows, cut as required daily, it is an invaluable producer of milk; and if cut during the Autumn, will shoot out and flower freely in Spring.

Poor Lands

can frequently be restored without ploughing at all. I had a very inferior field, and during a wet season in July had it heavily manured. After the manure was spread over the ground I sowed a mixture of clover seeds. The whole was then simply dredged with a heavy bush, and in a few days the clover was sprouting thickly over the ground. The new growth had all the nourishment required, and the following year I cut nearly three tons of valuable hay to the acre, where formerly it was not worth cutting. In such cases seeds sown without manure would only be wasted.

Area required for 100 Colonies, and Cost of Living.

Each square mile of 640 acres, it may be computed, will support 50 colonies of bees, if we consider the average irregular supply; but though this would give the bees only half-a-mile to fly each way, from a given centre, I hope to show that a much smaller area devoted exclusively to bee-forage, will support double that number of colonies in full profit.

During the season a fair colony requires for its support during six months of actual work—while feeding large patches of uncapped brood, in feeding thousands of young bees before they are able to work, in sustaining the wear and tear consequent upon the constant activity of the adult bees themselves, wax-working, &c.—something like 10 lbs. weight of honey, or its equivalent, weekly; or some 200 lbs. actually consumed during the several busiest months.* Add to this, 30 lbs. left as winter store, and 70 lbs. as a surplus, all items being really under-estimated, we have then the large total of 300 lbs. required by each populous hive. For 50 colonies this would amount to 15,000 lbs., or over six tons of honey to be gathered in one busy season.

The surplus would be put at 3,500 lbs. in the above case, but, dear reader, there is another way to look at this matter. The correct practice would be that of uniting two stocks into one at the commencement of the honey flow. This brings in a larger surplus, with a smaller consumption of valuable stores for the total number of bees cultivated. Thus the balance of available produce would be at the rate of three times 70 lbs. to each of the united 25 hives; *i.e.*, 200 lbs., or 5,000 lbs. instead of 3,500 lbs. from 50; with a consumption in balancing wear and tear, etc., one-third less, or say 130 lbs. to each of 25 hives, in place of 200 lbs. to each of 50, an enormous economy in valuable material, and one which fully accounts for the larger yield given by the smaller number of more populous stocks.

These doubled colonies, moreover, will seldom require

* It may be said that during a dearth of honey at mid-season it is known that stocks do not consume as much as this. But it should be considered they are then almost inactive, and have little wear and tear to provide for.

further feeding, as the single colonies certainly do in most cases, and thus a further saving, not enumerated above, is effected.

How can 640 acres produce 15,000 lbs.

of honey, more or less, according to management, in one season ? We will consider that one acre of flowering plants yields an average of 5 lbs. of honey daily, and if allowing only 100 acres to yield honey, this brings it out at 500 lbs. for each good honey day ; while out of the six months of the working season, in allowing only 30 days as good for honey gathering, we have then 500 lbs. multiplied by 30, giving the total of 15,000 lbs. for the season.

It may be safely considered that these averages are very low indeed, and it may well be said, "What then becomes of all this valuable food, so liberally provided by the hand of Nature, seeing it is so very seldom any apiary yields a surplus anything like approaching these figures ?"

It can only be that this gratuitous secretion of the flowery lovers of our tiny workers is lost by mismanagement in many instances. Stocks are not strong when they should be ; the right kind of bees may not be cultivated ; while lastly, too many colonies are often placed in one locality, when, indeed, the whole number are little more than useless consumers.

In many localities, therefore, it may be considered as a great point in management that 50 really sound colonies are all-sufficient for securing the highest results, and these for the time being should again be reduced at the right time, when the very best returns are anticipated.

But why confine an apiary to one square mile? Of course the bees from a given spot will cover a wider radius, but there are other bees, probably, in the neighbour-

hood, and it will in any case always be safer to keep well within the range of possibility, rather than extend our desires towards improbabilities. To sum up, therefore, it is not wise to exceed 50 stocks where honey alone is to be worked for, unless the apiarist is certain he has an exceptional locality, or has the land and ability that will enable him to supplement his local resources.

It should be remembered that the honey is obtained at no expense to the crop of hay, unless the same be allowed to stand too long before being mown. Even for the sake of the bees, most crops should not stand until the greater part of the heads die off, as such ripening process destroys the chance of a second crop. As a rule, those

Plants should be Grown that are Useful for Hay

after the bees have had their gathering. There is only one kind that I can recommend for bees which is unsuitable for cattle, and that is Borage. There may be many others that give much honey, but there is this about them—they require constant care and attention to keep the ground clean, therefore for honey alone such plants are quite out of the question. Borage, however, can take care of itself; outgrows everything else, yields the best of honey, and requires only that the ground be turned or ploughed, in the case of Borage every winter. This plant comes best with the ground turned up roughly and needs no further care; Melilot (*Melilotus alba*) is a most valuable honey plant, and when seeding down requires that the earth be harrowed and then rolled as often as possible whenever the surface is dry. Do not neglect to roll again the second year, both before and after the leaf begins to show. The omission of this very important matter is why the crop fails with many.

For a Succession,

the following will be found most serviceable. Italian crimson clover (*Trifolium incarnatum*) is an excellent honey plant used for early greenmeat, flowering generally in May, but can be sown to give a good succession. White or Dutch clover would follow at 15th of June till first week in July. Alsike follows white, which will keep up the succession till Melilot is in full flower at the end of July, the latter remaining in bloom as late as desirable.

Trifolium Incarnatum,

to give the best results for honey-production, should be sown with Melilotus Alba in August or September. The following Spring will see a grand supply for the bees, the crimson clover flowering from May to June, when the crop should be cut. The Melilot will soon follow and keep the bees busy for several weeks. This second crop can be allowed to stand and re-seed the ground, if a yearly crop following is required.

Trifolium incarnatum has of late years been highly extolled by American bee-keepers who seem only recently to have discovered its value, though a correspondent writing to the *American Bee Journal* of October, 1895, says he has been most successful with it, and considers it one of the most valuable crops that can be grown. The following advantages are claimed for it by the same writer :—

"It grows in the winter, and prevents the land washing. It yields more abundantly than common red clover, a kind of forage which horses and cattle prefer to almost any other. According to the report of the Experiment Stations its nutritive value is of the highest. I know that my horses keep in the best condition on it. It never causes "slobbering," as red clover often does. It can be

grown on sandy land where red clover will not thrive. But its greatest value is as a fertilizer, and as such is the best and cheapest known. It possesses more highly than any other leguminous plant, the power of conveying to the soil the nitrogen of the atmosphere. Its roots grow deeper into the soil than red clover, and are more numerous. It loosens stiff clay land, which, after a time, becomes as friable as if sand had been mixed with the soil. It has been shown by one of the Experiment Stations than an expenditure of 2.65 dols. on crimson clover as a fertilizer put as much nitrogen into the soil as 15 dols. worth of nitrogen purchased in commercial fertilizers."

Every bee-keeper should bring the advantages to be derived from the growing of this clover before the notice of his farming neighbours. It will benefit them, and at the same time help largely to make his own success assured.

Melilot Clover.

In my own trials with this clover on several acres, the sowing was made in April, followed by a very dry summer. It soon rooted, however, and threw out strong shoots, which showed green all through the dry weather, supplying a never failing source of feed for the cows, while old-established meadows were almost bare. The following year it was mown in July, and together with the rye-grass sown with it, afforded a very heavy crop. The plant was rather coarse, and the haying time very wet, but after it had been down some seven or eight days, just three hot days enabled me to get it dried and stacked. Notwithstanding the succulent nature of the plant and the wetting it had experienced, the hay came out as brown as a berry, and exceedingly sweet, though, of course, there was no bloom at the time of cutting.

The second crop was all that could be desired as a plant for hay, but being late and rather too thin, the cows again had the benefit of it, as soon as the blossoms were of no further use to the bees. The plant is useful for improving the land, and even if not ploughed under, the great roots rotting after the second year, and opening up the soil to a great depth, must be of vast service to following crops, as I have certainly found to be the case with this particular field.

At the Illinois State Bee-Keepers' Convention, held at Chicago, January 9th, 1896, Mr. Baldridge read a very interesting letter he had received from a farmer in Mississippi, who had grown 100 acres of sweet clover for pasturage of cattle and for hay. He had at the time 150 tons of sweet clover hay, and found that both his horses and cattle ate it as readily as that from the red variety. The same farmer said: "I have kept this season 55 head of stock on 50 acres of sweet clover as pasturage, and besides I have cut and saved from it 50 tons of hay. My stock had all the pasture from the sweet clover they could eat, and they are now very sleek and fat. The plant makes such a rapid growth that the stock and mowing-machine could not keep it back. Of course, if I were to go into the field and cut the sweet clover all down at once, I might then use it up, but I simply cut small plots at a time, so as to let the stock graze all the time. . . . The first year's growth of sweet clover is the finest grazing-plant to fatten stock of any kind that I ever saw, and especially late in the fall, when all other plants are gone."

The Queen of Forage Plants

is undoubtedly Lucerne; and in many of the great plains of America it is known to yield tons of honey under

irrigation systems; but in this country, no matter how it is treated, nor how fine the weather may be, bees rarely visit it, and then only in late Autumn in very small numbers, when most other plants have ceased to yield. This is unfortunate, as there is no forage plant which grows so luxuriantly, or recovers from cutting so quickly as lucerne; it may also remain on the same ground for many years in succession, but we must have the truth, and therefore I say, and say it regretfully, that the plant is useless for honey in any other than irrigated areas.

Late Forage Undesirable.

While we can hardly plant anything that will come in too early, it must be distinctly understood that nothing should entice the bees to work later than September in England. Bees need at least six weeks to regain lost numbers after winter is past. They require just as much time to settle down quietly before the cold season comes on.

Cultivation.

It will be understood that most of the above clover crops, etc., are sown over corn in the spring; the plant being well established by the time the same is harvested, and having the ground all to itself the second year. As to manure, it should be remembered that what is worth doing at all is worth doing well. Wood ashes are probably the best dressing for clovers, but as these cannot be got in sufficient quantity the most economic substitute will be Basic Slag. Among other manures may be mentioned Sulphate of Potash, ½ cwt. to 1 cwt. per acre, and Superphosphate of Lime, 6 cwt. to 10 cwt. per acre. Kainit is also useful; while ground lime is understood to be very beneficial where honey yields are desired. It is a fact beyond dispute that a dressing of light manure at the rate

of 5 cwt. per acre will be more profitable than 2 cwt.; 8 cwt. than 5 cwt.; or 10 cwt. more so than 8 cwt. That is, the heavier dressing will give a much larger proportionate increase and profitable returns; but, of course, this does not refer to concentrated potash and nitrates, of which ½ cwt. to 1 cwt. is sufficient. It should not for one moment be forgotten that "light manures" encourage clover development, while heavy manures smother it, and produce rank grasses.

Sanfoin is an excellent plant on chalk soils, giving two crops yearly, as also will several of the clovers if treated liberally. The former is allowed to remain from two to ten or twelve years, according to the nature or cleanliness of the ground; when brought under cultivation, a second sowing will be of no avail until after a period of fourteen years. Red clover (*Trifolium pratense*) is nearly always ploughed in after the one full season's growth, and does not follow on the same ground again until after a term of seven years. Yellow trefoil or hop clover should be mixed with Alsike or white clover, or with sanfoin to make a good first crop. After the first mowing the trefoil does not again appear, but the main crop then branches out and fully covers the ground.

I have found that for all small seeds, such as clovers, the ground should be finely pulverised and rolled before the seed is sown. Do not rake or harrow after it is in, but use the roller again and again, when the ground is dry. In too many instances the farmer gets a thin stand of clover, and then blames the soil rather than his own practice of setting the seeds so low that only a small proportion of them germinate.

Whatever may have been said in the past, it must be distinctly understood that Red Clover (*Trifolium pratense*) is *not* a reliable bee plant. I have had considerable honey

from it when the weather has been just right, following a dry time for the growth of the second crop, but should the plant have a favorable season for full and coarse development, the bees do nothing upon it, however fine the weather may be. A crop yielding only one year in four cannot be recommended.

When growing plants for honey which have no further use, one must make the most of the land under cultivation. To permit the ground to be occupied by a single variety taking two years to arrive at maturity is sheer folly: and even with those flowering yearly something else must be growing at the same time. The white clover is particularly partial to road grit, and where the sidings can be secured, they will be found the most valuable fertilizer that can be obtained for the crop; often inducing a heavy growth where the plant was seldom seen previously. A great advantage to be gained from continuous bloom is that the surplus may be removed at any time without exciting the bees to rob, as is too frequently the case when the later harvest is taken at a time when they have nothing more to keep them employed.

Systematic Planting makes Profits Certain.

This branch of apiculture has been much neglected, but bee-keeping as a profession can only become a certainty in this country where systematic planting is carried out. Indeed, even in America the same statement would apply to most districts, as there is a frequent occurrence of poor honey seasons, whereas with heavy crops close at home it could be so arranged that a good surplus would be obtained *every* year; but with scattered crops it sometimes happens that the bees store little or nothing.

In this country it is almost useless for any bee-keeper

to attempt to get a living from honey-production unless he can afford to farm sufficient land to materially assist his apiary. In that case he should at least clear his rent by his hay-crops, so that he will have the entire produce in honey as clear profit, while the proceeds of the necessary farm stock will pay his labor bill.

Does Artificial Pasturage Pay ?

A remarkable letter appeared in "Gleanings in Bee-Culture" for July 15th, 1902, from Dr. Gandy, who appears to have made a financial success of planting for bees. He says: "I give herewith some ideas obtained during my 30 years' experience as a bee-keeper, the last 17 of which I have handled them as a commercial pursuit, keeping during this time from 500 to 3,000 colonies, 100 of them being in my home apiary. . . . I claim by my method of handling, of which I can describe only some of the principal features, bees can be made to produce double the ordinary surplus and perhaps more. I assume that the reader is a bee-keeper who has plenty of nectar-secreting plants in his neighbourhood, as any section can be made a good place for bees at an expense of 60 dols. for catnip and sweet clover seed, and this sum is less than the profit I derived from a single colony last year. Much of this increase is attributable to the plants; but I am confident that my particular methods helped largely to bring about the greater yield.

"When I started bee-keeping on a large scale my neighbour bee-keepers did not average a surplus yield of over 50 lbs. per year to the colony. I immediately set about improving the bee-pasture, and my average yield of surplus for eleven years was 150 lbs. to the colony, and for the last six years it has been 300 lbs.

"My increase has always paid all expenses, including

10 per cent. interest on the investment. I produce chunk, extracted, and section honey, and sell all at 15 cents. per lb. in this and neighbouring towns. My net profit for eleven years was a little over 400 per cent., and for the last six years it was a little over 800 per cent. Last year my home apiary, of which I am now writing, 75 colonies (spring count), gave me 407 lbs. to the colony. . . ."

The Fruit Grower is largely indebted to the honey-bee for the abundance of his crops ; while the Farmer would not be able to rely on seed crops if there were no bees to fertilise the blossoms. Consequently the farmer and fruit grower should either encourage any local bee-owner, or otherwise keep bees close at hand, thus ensuring the best possible results.

CHAPTER VIII.

THE AGRICULTURIST AND FRUIT GROWER.

THE value of crops suitable for bee-forage has been shown by the preceding chapter. The bee-keeper who is also a farmer therefore has every advantage and can make profit in several ways. But while it is necessary that the extensive bee-keeper should also be a farmer, it is quite as important that the agriculturist should keep a few stocks for the sole purpose of fertilising the clover, turnip, rape, and other crops he may save for seed, if it happens that few bees are cultivated in his neighbourhood.

It should be distinctly understood that the more bees that can be obtained as fertilising agents, the more seed will be perfected, as well as more fruit. Single hives have been placed in cucumber and peach houses, and though some bees are of course lost in the first instance, the younger portion of the population never having flown outside, have no difficulty in finding their way about. The results have been reported to be most satisfactory, and the plan should be more extensively adopted.

Strange as it may appear to those who are inclined to grumble at the visits of the bees to their fields or gardens, it is a simple matter of fact that if the honey be not gathered it will only evaporate, and none is secreted after the flower begins to fade.

Fruit growers often complain that the bees damage their fruit crops, and in autumn, when there is nothing else to be obtained, because they see a few bees among the wasps and flies, the former get all the blame; whereas they have never been known to break through the skin of sound ripe fruit, but simply collect the juices that may be present where birds, wasps or other insects have first made an inroad.

Spraying Fruit Trees in Bloom.

Fruit growers should be cautioned against spraying fruit trees when in full bloom with any poisonous substance. Not only is the process an unneighbourly and cruel act, causing the deaths of thousands of bees that visit his trees *for his own certain benefit;* but he is at the same time showing his own unwisdom and want of thought, inasmuch as the dressing at that period of development does more harm than good.

So convinced is the Author of this fact that he avoids spraying at that season, and carries out other measures which largely do away with the necessity of spraying the trees in his orchard unless it may be in the winter. Permanent metal guards are placed round the stems of the trees, and while these may not absolutely prevent the female moth ascending it will be found that numerous earwigs collect under these cone-shaped guards, while ultimately spiders with their webs, and these are enemies of the moth. The cones also prevent other creatures from ascending the trees.

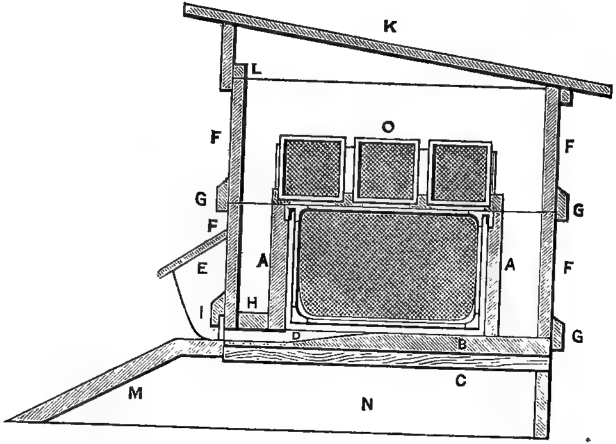


FIG. 7.

The "Cowan" Hive as used for Comb Honey. One of the earliest types of modern hives.

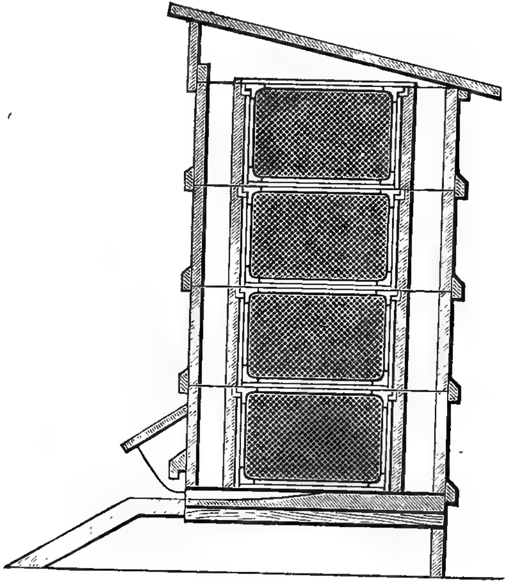


FIG. 8.

The "Cowan" Hive as used for Extracting, with all Standard Chambers.

The Author also sows sulphur thickly about the trees in Autumn, and while this helps to keep the moths away, it will be found most beneficial to the ground, both in cleansing the soil and in making its chemical constituents more readily available as food for the trees. An occasional heavy dressing of ground lime will also be found beneficial in a similar manner, as this also renders available hitherto insoluble matter.

It should, however, not be forgotten that where trees are actively growing and provided with every chemical requirement for maintaining that activity and fruitfulness, insect enemies and other pests make little or no impression upon them.

A Disagreeable Feature

in connection with bee-keeping, when carried out near towns, is that the bees will persist in visiting the fruiterers' stalls. The proprietors have of course every right to defend themselves from what, to them, is a perfect plague, as they dare not expose anything sweet, or fruits with the least sign of broken skins during the autumn. Frequently the bees outnumber wasps by hundreds until the fruit is black with them, and where possibly a wasp only makes a beginning, the bees soon make a finish. Thousands of these innocent pilferers are trapped and destroyed like common wasps and flies, and no doubt in many instances the owners of the bees see their colonies dwindling down to sheer uselessness, while helplessly looking on. One cannot persuade the fruit-seller to put all his wares under glass, and the usual netting is of little avail. So die the bees must, unless the apiarist takes active means to prevent these dishonest visits. If he does not, he not only deserves to suffer, but has no right to keep bees that are a nuisance to his neighbour.

Possibly in the case of breweries, or jam factories, the owners, for their own protection and profit might be persuaded to cover their windows, etc., with woven wire; but nevertheless there is just one way whereby the bee-keeper can avoid all this trouble and loss of bee-life. Let him

"Feed Solid"

as soon as he finds no more honey is to be gathered, and therefore immediately he can remove the surplus. Bees with their combs solid with sealed stores, will have no reason to search for injurious sweets. They will sit quiet, and not even trouble to rob during that period when half-fed or starved stocks are ever on the alert. The owner will not only save his bees, while doing his duty to his neighbours, but will have his stock in the best possible condition for wintering, and rapid progress thereafter.

Fruit Culture

for the purpose of jam making is now making such rapid headway in this country, that all growers should have the subject of bee-culture brought very forcibly before their notice. The presence of a few hives in the immediate vicinity of fruit gardens and orchards is not simply a benefit to the grower, but is a matter of the first importance; and those who wish to secure the nearest approach to constantly recurring profitable crops, will find it an absolute necessity to encourage the presence of the domesticated honey bee. In some instances at least, particularly with farm crops, there is simply the loss of seed where the flowers had escaped fertilisation, but in far too many cases where the blossom is not fully fertilised by the agency of the bees, the fruit is not only imperfectly developed but in many places does not develop at all.

In a neighbourhood where many bees are cultivated,

and more particularly in the garden they may occupy, it is very rarely, indeed, a poor crop of fruit is found, simply because the bloom is so thoroughly and regularly fertilised by the action of the bees, in securing a constant transmission, and mingling of the pollen.

It is plainly evident that the fruit grower of the future who attempts to conduct his business without taking every means to secure the aid of the industrious honey bee will be like a captain attempting to carry his ship through the sea without a rudder. More or less success has of course been obtained in the culture of fruit in the past; but the growers have not hitherto had their eyes fully opened, that they could tell why the greater success, or the least profitable result, and even loss, should occur. The proximity of a larger or smaller number of hives will generally be found to sufficiently explain the variations. The state of the weather, and all supposed enemies of the fruit gardens, will receive far less consideration when the foregoing remarks are fully appreciated and acted upon. A single hive, or even a dozen, will be of little use where there are large gardens and orchards. From 25 to 100 stocks will be needed to secure the best possible results, according to the extent of the fruit farm; and even if no one on the premises understands the management of bees, after defraying the expense of employing an expert either occasionally, or permanently where the number nears 100, there will be a considerable profit on an apiary so favorably situated, while the immense benefit conferred upon the fruit crops will be entirely gratuitous.

Any neighbouring bee-keeper should be encouraged, and in many cases expense may be saved by arranging with such apiarist to place a few of his hives in some sheltered spot on the premises, where the bees will be close at hand during the critical period of fruit bloom.

Pruning Fruit Trees.

Bush, pyramid and standard fruit trees require the excess of branches removed rather than any systematic pruning, which is generally understood to mean cutting back the tips of the shoots.

This latter plan should be avoided so far as possible until the young trees are well developed, and only when the dwarf trees are beginning to crowd each other. If, then, about two-thirds of the current year's shoots are cut back in November, they will be found to set fruit buds instead of continuing to grow wood.

Some of the upper shoots should still be allowed to grow in a manner that they will not become crowded. If too many spurs form where the shoots are set back, these must be thinned out when pruning the following year.

Where a tree sets too many fruit buds at the expense of growth, these should be nearly all removed for at least one season, leaving only the leaf buds, when the tree will rapidly recover if well nourished.

The growth of too much wood is sometimes checked by digging down to the roots and cutting through some of the stronger ones, when finer rootlets will be thrown out and the tree become more fruitful. Anything that checks the too rapid production of wood will tend to induce fruitfulness.

For instance, if the bark is injured short of destroying a tree that has not been fruitful, it will be found to crop heavily thereafter. It has been shown that barren trees, after being shot in the main stem, will in like manner bear abundance of fruit; but of course this is only an example, and not by any means a process to follow.

Some trees may be "hide-bound," and will immediately take a new lease of life if the bark is slit in a vertical line.

Walnut trees are considered to bear better, or begin to bear if beaten, and there is an old saying, " A wife, a dog, and a walnut tree, the more you beat them the better they'll be."

The Author's Orchard

consists of some four acres, with standard Bramley's Seedlings, set out at 27 feet apart. Between these again are dwarf trees grafted on Paradise stock; the varieties being limited to Cox's Orange Pippin, Bramley's Seedling, Worcester Pearmain, and one or two others. In new orchard planting the great object is the production of large quantities of apples or pears in limited variety, each variety being carefully selected, and separated. These require little or no expensive labor in gathering, but in growing small fruits, much hired labor is necessary, while the marketing is often a risky business.

Bee-Keeping Alone.

I have had many applications from those who would leave their present occupation, so that they may keep bees only, as a source of income. There could be no greater mistake in this country, than for an inexperienced man to set aside everything and go in for honey-producing only. If he wants to go into the country, he must have land; then if he has land he must have stock; and in a small way his stock should be principally good milking cows. Consequently when he has land and stock, he will also be a producer of hay, and now we begin to see how a man, pining after a freer and healthy outdoor life, may support his family, if not in affluence, then, at least, in comfort.

If the reader wishes to see this desirable state of life realised in his own case, he must be a man with a certain amount of capital, and be prepared to spend a year or so on a suitable farm where he can see how the routine

is carried out day by day. But if one has little or no capital, he must, of course, be content to start from little beginnings, and work up gradually upon the rules herein laid down, when if he has sufficient energy and "grit" he will ultimately push on over every obstacle.

Profit from the Land,

we are told, is something belonging to the past. But it is only the grumblers, the shiftless, and those who cannot or will not change with the times, who tell us this tale. Until quite recently the holder of a 300 acre farm was clearing £1,000 per annum from ordinary farming. Another well-to-do farmer having good grazing ground, made better by being constantly stocked, recently told me he would buy in a lot of two-year-old bullocks, and within a few months always sold them fattened at a clear profit of £5 per head.

Then just profit by the case of an old gentleman, who in that wonderfully dry year of 1893 had on hand seventeen hay stacks, each representing the proceeds of a different year; and all sold at £10 per ton. Now if each stack amounted to only ten tons, what a nice little sum, £1,700 quietly accumulating, during all those years. But, of course, the farmer will not always be so fortunate as this, but why should he sell for £2 or so when hay, sooner or later, goes up to £5 or £6 per ton? At these figures it should be held no longer, for it does not do to be too certain about such prices continuing; as instance another farmer in 1893 was offered £10 per ton for 50 tons; but no, he must have ten guineas; when lo! by the following Spring the value went down rapidly to less than half.

A Thirty Acre Farm.

Of these, 20 acres should be laid off for hay, leaving eight or nine for pasturage for stock; the balance being

occupied by the house, farm buildings, gardens, etc. After the land is worked up into a condition of settled stability, by the use of farm-yard manure, by pasturing cattle, the keeping of poultry, the judicious use of artificial manures, and re-seeding if and when required, the occupier will have a bank at his own back-door, such as few other investments can offer; as when land is once brought into a state of great fertility, the cost of keeping it so is comparatively little. If he has not in the first place the means to bring it rapidly to this condition, then as before stated, it will be a matter of years in the doing.

Very well, at this stage, at a moderate estimate, the 20 acres will produce 30 tons of hay yearly, which at an average rate of £3 per ton will be worth £90; but leaving ten tons for home use, we can allow for 20 tons to be sold for £60.

Cows and Growing Stock.

The remaining eight acres, after excluding other plots and a large garden, should be worth £10 per acre as pasture for cows in milk, and young growing stock, for the open season, say from March to September; this being equal to £80. I will now show how this is understating the facts. A four-acre field which would hardly yield one half ton of hay per acre when I took to my farm, has yielded £2 a week in milk and butter for seven months from two cows and one heifer; besides supporting for that period two other heifers, thereafter coming into profit; a total of £56 from the four acres. But these were Jersey cows, and good Jerseys at that, such as *average* 10 *lbs.* of butter weekly during the whole period they are in profit. It costs no more food or attention to keep good stock than is required for poor profitless animals; then why should a man bother himself with sheer rubbish on which he is losing money daily?

Folding Fowls on the Land

just as you would a flock of sheep, is something which many people are not acquainted with, and which our old-style farmers do not understand, and it is doubtful if they would take the trouble to do it. Well, this is how fowls can be made to pay to-day, in large pens which are shitted two or three times a week regularly and evenly over the land; so that where formerly half-a-ton of hay was secured, two tons and more is now the yield. Even in this district wherefrom 100 tons of dead fattened fowls are sent up from one station weekly, the Author is probably the only breeder who thus shifts his chickens over the land in movable pens. A 30 acre farm may easily carry

100 Breeding Hens,

besides the thousand or two chickens reared therefrom during the season, and the profit from each hen is usually found to be ten shillings for the year, in eggs and chickens produced. Here we have another £50 after paying all expenses. Consequently we are still left with the most important and most profitable department of culture upon the farm, that of the bees; and yet these require less labour and attention, and far less feeding than any other stock upon the place, when once the hives are well established.

They will show larger and more valuable returns than the cows, or the hay, and yet I will place the profits so low that the greatest grumbler will not be able to find fault with this, the modest sum of £1 per hive for 50 colonies of bees, standing upon less than one-fourth of an acre. But then you see they take toll from your neighbours' acres, from woodland and forest, his open pastures, gardens and orchards, and his waving fields of

clover, with dancing heads bright with many attractive colours. And above all no rent is paid for this innocent trespass, and no harm is done to the owner, for the busy bees take that which he can never harvest, and that which he hath not cannot from him be robbed.

The Total.

Now what do our figures show from 30 acres:—

	£	s.	d.
20 tons of hay at £3 (less all expenses), say ...	60	0	0
8 acres of pasture at £10, as profit from dairy, say	50	0	0
100 hens (eggs and chickens from), say	50	0	0
50 stocks of bees, yielding £1 each	50	0	0
Profit on horned stock sold annually	20	0	0
	£230	0	0

If a smallholder pays £3 an acre this will leave him £140. If he pays £4, then only £110.

I have therefore allowed the usual margin upon the expenses of getting in the hay, for carting, and artificial manures, if required; there is also a second cut from one or other of the fields, to be utilised for home use. On the eight acres of pasture also enough margin is allowed for paying a large part of the rent, or labor; though an active, healthy man will not require much hired labor on a little grass farm apart from the haying. The 100 hens and the several thousand chickens reared therefrom will leave a very large margin towards rent and other expenses, in the valuable manure left upon the land. Then again the 20 acres after cutting, will in value of pasture alone, make a heavy item towards the rent of the farm.

When I state that in apiaries worked for honey the stocks will often average 100 lbs. per colony, while some colonies of bees have stored up to 300 lbs. and more, and

my own apiary yields several times the amount shown, it will be agreed that the profits from a 30 acre farm are not by any means overstated, especially as I have not set anything down as a profit from the young orchard of four acres, which should form part of a 30 acre farm when owned by the occupier.

The proportion of profit from a larger holding will, of course, decrease, because of the greater expenses in labor and other items; but I am aware that very small holdings when used for market gardening purposes will show much larger returns at times, but there is more expense in labor, and more risks to run.

Unfortunately the average small holder will prefer to go out to work rather than make the most out of bees and fowls; while the stock usually kept is of very inferior quality. Such stock does not pay for itself, and often there is little more than the produce of the land to set against rent, leaving but a poor sum for family expenses.

Why will so many men "stay down?" It is because their eyes are sealed, and they have "no vision beyond."

The diseases from which bees and bee-brood are likely to suffer should cause little or no depreciation in the annual honey yields—if the owner is wide awake, and will apply immediate curative treatment, such as the Author explains. Every known disease of bees can be and must be excluded from the apiary by systematic endeavour.

CHAPTER IX.

ENEMIES AND DISEASES OF BEES.

THERE are many creatures that will eat dead bees, but if all colonies are in good condition there is no enemy known in this country that can cause any serious depreciation in the population of our stocks. Birds occasionally take bees, but according to my own observation dead drones and workers are usually eaten, or those which may have become chilled.

Wasps do the same, but are not often able to rob the stores of a hive unless it has a small population. Hornets will pick up workers from the entrance more readily than any bird, but luckily they are not very numerous, and are rarely seen.

Ants are at times somewhat worrying, but these may be checked by fixing special cast-iron cups to the legs of the hive, and placing therein oil, Izal, or some other liquid disagreeable to them. Izal powder dusted around the base of the hive, when there are no legs, will check the ants, as well as moths and earwigs, if dusted over the quilting where these are troublesome.

Dysentery

is one of the more simple diseases to which bees are subject, and this is known by the bees soiling their combs and the flight-board with their excrement, being unable to rise on the wing before voiding the same. This occurs in early Spring, just as it is hoped the bees have passed the worst of the Winter. It can generally be prevented by providing that they have plenty of good stores, judicious ventilation, and free passage under the frames (*see* "Wintering"). A cure is to be effected by feeding warm syrup on the first fine day, thereby also inducing the bees to take a general flight. If the combs are very badly smeared they should be removed and clean substituted.

Dysentery is very readily induced by any exciting cause after the bees have been a long time without a cleansing flight. Thus, a stock, apparently in the best possible condition, may from some quite avoidable occurrence have its entrance choked by dead bees, and then the more prosperous the colony, the more disastrous will be the result.

By far the greater number of cases may be put down as being caused by semi-starvation. A small lot of bees unable to reach stores situated away from the cluster, will generally perish without excitement during a too long spell of cold, the cluster remaining unbroken just as the bees rested upon the combs. But take the case of a strong stock, particularly where a patch or two of brood has been started, and instead of continued cold compelling them to remain and die where they sit upon their combs, their very strength is the cause of their own destruction. They generate too much heat to remain quietly clustering where all the store within reach is at last exhausted. Though too cold yet for individuals to reach the more distant, but still plenteous store, the bees fully aware of

their critical position, soon arrive at an excited condition, the temperature goes up rapidly, the cluster expands, and the lately unapproachable stores are within reach. But the instinct of self-preservation does not allow them to count thè cost—the tremendous discount thus made upon their vital energies ; neither can they avoid the fouling of their once clean, sweet smelling home.

Should a warm day soon follow this untoward excitement, the after effects are to a certain extent modified, as a good cleansing flight can be taken ; but when the cold still continues, the bees never again being able to regain their former state of semi-hibernation, drag out their existence wandering aimlessly about, and die at a rapid rate, each day adding to the accumulating filth of the hive.

Prevention.

This form of semi-starvation, with its possible consequences, is to be avoided by seeing that every hive has heavily stored combs of good sealed food to winter on. A stock, even if already partly stored, if fed with ten or twelve pounds of thick warm syrup, rapidly, towards the end of September will store such food in the immediate vicinity of the cluster, and will stand well, until the following Spring is warm enough for the bees to move freely about the hive. Dysentery will probably never follow after such a provision has been made, unless through carelessness or some other exciting cause, such as a choked entrance, sour, watery food, or the other extreme —granulated stores.

Another Item

of considerable importance as a preventative, is the adoption of a large frame, when a greater store of food will always be found within reach of a more compact cluster. In a semi-hibernating condition, during cold weather a cluster

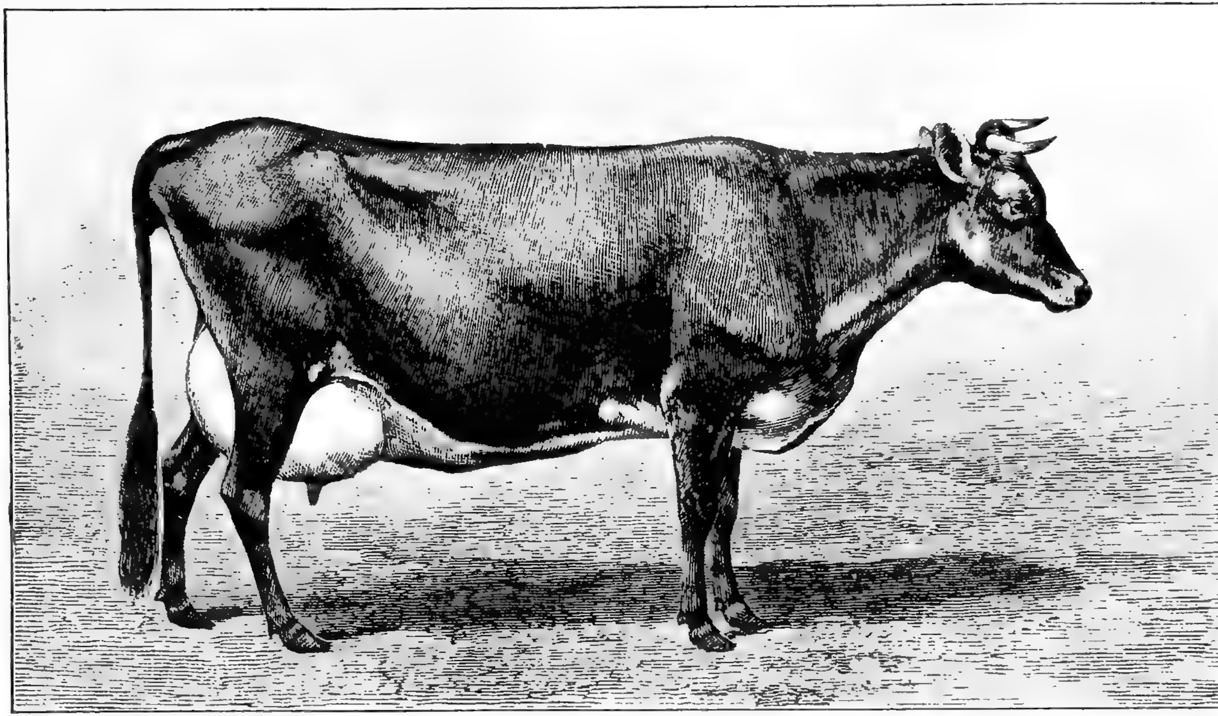
of bees has no difficulty in gradually moving along the surface of the same combs, and can do so without there being any reason for excitement, but when it becomes necessary to shift on to an entirely fresh set it means, as we have already seen, a disastrous disturbance of their natural economy.

Foul Brood, or Bee Pest,

was the only really serious disease the bee-keeper had to contend with prior to the recent advent of infectious paralysis. The late Mr. F. R. Cheshire conducted many experiments and investigations in regard to this matter, and was certain in his own mind that the disease affects not only the brood, but the adult bees and the queen as well. He also assured me that the disease could not exist in the presence of acids, and though he was able to show a stock completely cured by his own treatment with a solution of carbolic acid, it would appear by the light of my own experience, and the numerous failures reported by others who have tried to follow out his treatment, that he was not quite on safe ground, as we shall presently see.

Initial Stages of Disease.

It has so frequently been stated that the disease can be discovered by the foul smell emitted by the stock which may have it, that I consider it necessary to warn the uninitiated not to wait for such a rude awakening. At that stage it is very infectious indeed, and it will be a saving for the inexperienced person to burn the contents of the hive, after first suffocating the few remaining bees. With a colony in such a state the novice is certain to do only harm by attempting a cure, and with his want of experience, he will do well to be clear of it.



A TYPICAL JERSEY COW;

The property of Dr. Alfred Brown, of "Summerlands," Heathfield, Sussex.

This cow ("LOVELY") gained First Prize at the Show of the R.A.S.E. at Windsor, in 1889, for yielding the largest weight of butter and milk; and in the year 1899, for more than two months after calving, she gave seven gallons of milk daily, and 28 lbs. of butter weekly. The Author's Jersey herd are descendants of this wonderful cow.

CAUTION !

should be the bee-keeper's watchword, while extreme vigilance will bring its own reward. Those who have never seen foul brood should be most careful to note that frequently in summer its appearance is to be discovered by irregular or "patchy" slabs of brood, among which there are no black or rotting grubs whatever; for while the bees are actually storing, every sickly larva is at once removed; so that when patches of brood known to have been quite compact are presently of irregular ages and appearance, it is time to be suspicious. Even at this stage the experienced eye may detect occasional sickly grubs, and some may not even be discolored. If a single larva lies in an irregular position in its cell, then the owner's suspicions must be aroused, and the combs kept under close observation.

There is only one position that the unsealed larva should occupy, and that may be described as a crescent form, and always so presented to the observer. The exception is sometimes to be found in the case of drone brood in worker cells when the grub is too large for its cradle.

Several Forms of Brood Disease.

Cheshire found bees were troubled with several brood diseases, though he did not name them all. Later investigators with improved instruments have been able to verify his statements, and have named other disease germs which they consider more fatal than *Bacillus alvei*.

Our American friends are now describing *B. alvei* as European foul brood, or black brood; and the more virulent form as American foul brood. The reader may rest assured that the treatment given herein will enable him to cure any form of the disease, if he will only act without delay.

Do not by any means wait until the complaint is strongly in evidence, with the unsealed larvæ turning yellow, and then dark brown or black, instead of ever presenting a pearly white appearance, while some of the capped brood is in the same state, with coverings pierced and sunken. Now, here is a distinction to be observed between the genuine foul brood and simple chilled or dead brood. In the former case none of the larvæ dries up to a white cinder, being always rotten and slimy, so that the bees do not, as a rule, remove it from the cells. In the case of

Chilled Brood and Simple Dead Brood,

the former is soon removed by the bees, and should any be overlooked, it dries into a hard lump without changing colour. Simple dead brood resulting without chill, and with no apparent evidence of disease, has in some cells the appearance of the genuine foul brood, but with this the greater part of the nearly mature bees dry up and retain their original form and colour. By this feature alone I have always been able to distinguish the difference between the two, and have put an end to the more simple affair in all cases by destroying the queen and giving a young and vigorous one to the colony.

Cheshire's Remedy

was absolute phenol or pure carbolic acid, used in the proportion of 1-400th in the syrup fed to the bees. I have found the first step towards a rapid recovery is made by deposing the reigning queen, and giving a young and vigorous queen bred from clean stock, when the entire attitude of the bees is changed, and great determination and energy takes the place of the former utter inability to clear out the foul stuff.

If the disease begins in the early spring and is not noticed, it is very likely the colony will go down at a rapid rate, while the remnant will not be worth troubling with, and should be cleared out by fire after sulphuring the bees. This should be done in the evening when all the other stocks are quiet, taking care to foul as few things as possible; burn all you use that is not of much value, and the rest disinfect thoroughly.

Rational and Simple Cures

for foul brood have been so long known to many practical bee-keepers, that it seems strange there are others quite unable to cope with the disease when it makes its appearance in their apiaries. The cause of this in the first instance must be inexperience, but on the other hand where the inability to cure can not be put down to wilful negligence it is almost certainly through want of *caution.* The disease has been cured in the past, and can be as readily cured to-day. There is really no excuse whatever for the continued existence of foul brood in any apiary, in the light of facts now being placed before bee-keepers.

Foul Brood a Terror no Longer.

So many bee-keepers have been wrecked upon this hitherto dangerous rock, that my somewhat extensive treatise upon the subject may be excused by my determination to end once and for all, if possible, those endless worries, and constant waste, to which sufferers have been subject.

I have endeavoured to show how the disease, if handled in a rational manner, need have no further terrors either for the amateur or the commercial bee-keeper, and there is therefore no reason why the industry should not be placed upon a firmer basis than hitherto.

The Definite Izal Treatment

followed by those who have experienced the lasting pleasure of seeing their diseased stocks turned into healthy, profitable colonies was recommended by me, as follows :—

(1.) Use one teaspoonful of Izal to one quart of water, and dash the solution over the tops of the frames and bees ; or use a powerful spray syringe. Replace the quilt quickly. Combs not occupied by bees may be well saturated and returned one at a time as the bees are able to cover them.*

(2.) In commencing to treat any very weak diseased stock (seeing that this treatment obviates any destruction of combs where there are sufficient bees) first of all give the said colony a full comb of healthy hatching brood. If this cannot be done, then burn comb, frames and bees at night, first smothering the bees.

(3.) *Treatment with Izal Solution.* Have a change of hives, and wash out each week (three times will generally suffice) with solution of one teaspoonful to one quart of water. At the same time saturate the whole of the quilting by dipping it into a pan of the solution, and if warm, do not wring it out ; and continue this once a week until satisfied all is well.

(4.) If requiring to shake the bees off their foul combs for starting on new foundation, they should be thoroughly sprayed overnight—bees, combs and everything. Next day they may be safely started in a clean hive without any intermediate starvation or confinement.

(5.) *If desired to feed.* Use only half teaspoonful to ten pounds of sugar made into syrup.

---

* Common rubber sprays are quite useless for treating bee diseases. A powerful dust spray or fine spray syringe will be found effective.

(6.) *The Water Supply.* One teaspoonful of Izal to eight quarts of water.

Izal and Foul Brood.

Experiments conducted with Izal, and *especially the methods of applying it* as advised by the Author, have placed this germicide in the first rank as a cure for foul brood. It should be made known to every struggling bee-keeper, who too often falls under after using the many useless applications he has been told to apply, in the face of repeated failures known to have occurred where such have been tried.

At my recommendation, many bee-keepers have absolutely expelled the disease from their apiaries by the use of Izal. Phenol and many other supposed remedies, hitherto advocated, have been obnoxious to the bees, if not absolutely poisonous both to them and the operator ; whereas Izal is not only harmless, but is decidedly liked by them ; so much so that if the Izal bottle is left exposed, bees will frequently crowd into it, as if it were honey or sugar. This is a very great point gained in the treatment of the dread plague, as syrup to which the remedy has been added, is readily accepted at all times.

Curing Disease without Medicine.

We have seen how brood diseases may be checked by the aid of simple but effectual medicinal agents ; and although bees are somewhat more difficult to treat by hydropathic methods, I will show how disease may be disposed of without medicine.

Queenless bees, especially Cyprians, Italians and Carniolans, or such as have a virgin queen meanwhile, will not fail to clear out all evidence of brood disease. Replacing an old queen by a young vigorous one of either of the above varieties will also result in the same condition.—*Change of Queens, "A Modern Bee-Farm," 1888, 1893, 1904 editions; also "Bee Chat" Propositions, 1898.*

CHAPTER X.

BEE DISEASES; YOUNG QUEENS AS THE FOUNDATION OF CURE.

Supplying a young queen after an interval; by immediate exchange, with certain varieties; or by adding fresh brood and bees; also swarming so as to leave young bees on the combs.

DURING my experience with foul brood in 1875–8, I gave whole sets of diseased combs to *queenless* lots; and at the same period I also found by removing the original queen from Italian bees, and leaving them without a fertile queen until they could rear another, or had a virgin given them, that every vestige of the disease was cleared out by the bees.

By the year 1886 my experiments were fully confirmed, and I published the knowledge I had gained, that the removal of the original queen, presently followed by the introduction of a vigorous young one, was one of the very first steps to be taken in effecting a cure. I pointed out this fact in the pages of the *British Bee Journal* at that period, and have since mentioned the advantages of such

change of queens in each of the several issues of this work; and more particularly in "Bee Chat" for 1898, where I set forth several definite propositions.

Addition of Healthy Brood and Bees.

I was able to prove that the addition of clean brood and bees was another very effective item in reconstructive management, as such augmentation of healthy bees ensured a more rapid recovery.

Swarming Diseased Stocks.

Where the disease is discovered in good time, and the season is favorable for honey gathering, there is no better way than that of dividing the colony, leaving all young bees on the old combs by moving them away to a distant stand. In this case the flying bees returning to the original site may have the queen and a supply of foundation.

The young bees may rear their own queen or have one given them at about the same period, and by preference an Italian, Carniolan or Cyprian, if the latter can be mated to drones of either of the two first named. The starvation plan can be avoided if the stock is treated with Izal overnight, and only in that case, unless the hive can be removed quietly at mid-day without smoking or jarring, when the bees will not gorge themselves with honey.

Clearing an Apiary at a Stroke.

An old correspondent, a doctor, once wrote me his bees had become badly affected with foul brood, and he feared unless I could help him to quickly cure them he would soon be without his beloved bees. He was an enthusiast with an open mind, and was quite ready to act upon my advice—and he did, without one question. I suggested that he should at once remove all his queens which were natives. On the third day thereafter he was to *exchange* places, the

stronger with the weaker, and in ten days after the exchange to give each stock a young Italian queen. Within three weeks he wrote me that his stocks were cured, and all building up with none but healthy brood.*

The Author's Position Confirmed.

Some two years after the publication of my 1904 edition, Mr. Alexander, an extensive bee-owner in America, contributed an article to "Gleanings in Bee Culture," showing how he had cured large numbers of diseased stocks during 1904–5, and by exactly the same means that I had for so many years been placing before bee-keepers.†

Notwithstanding the interest created by Mr. Alexander's article, and others by myself in the same Journal, my English and other critics would not believe there was any advantage in a queenless interval; in the exchange of queens; or the addition of healthy bees and brood.

Presently my position was further endorsed by a French bee-keeper, M. Wimel (*British Bee Journal*, December 3rd, 1908, p. 481), who was able to offer convincing proof that the period of probation, followed by the insertion of a vigorous young queen, resulted in a complete cure where otherwise medicinal agents had failed.‡

Truth will come to the surface sooner or later, and although my critics of the *British Bee Journal* were incredulous, and a writer referred to me as "one of the simpletons" who expected to cure foul brood by these methods—overlooking the fact that I had done so many

* The Isle of Wight pest can be successfully treated in the same way; always allowing unusual ventilation.

† Mr. Alexander had quite recently declared that *he had read every bee-book published in the English language for* 40 *years*, so without question he was aware of the facts I had already set forth.

‡ M. Wimel also doubtless had seen the translation of Mr. Alexander's and my own articles in the French Bee Journals.

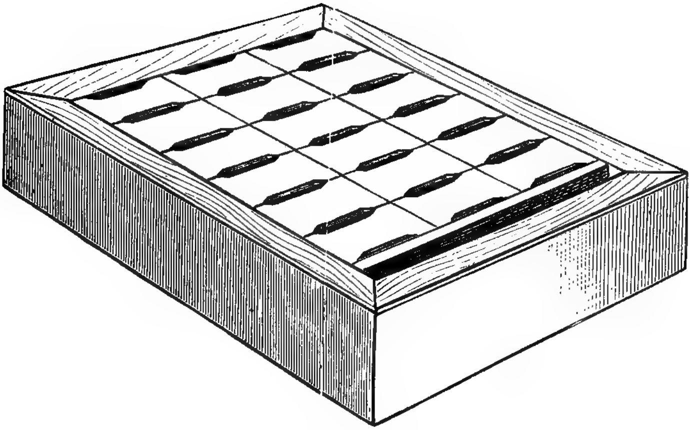


Fig. 9.
Commercial Super.

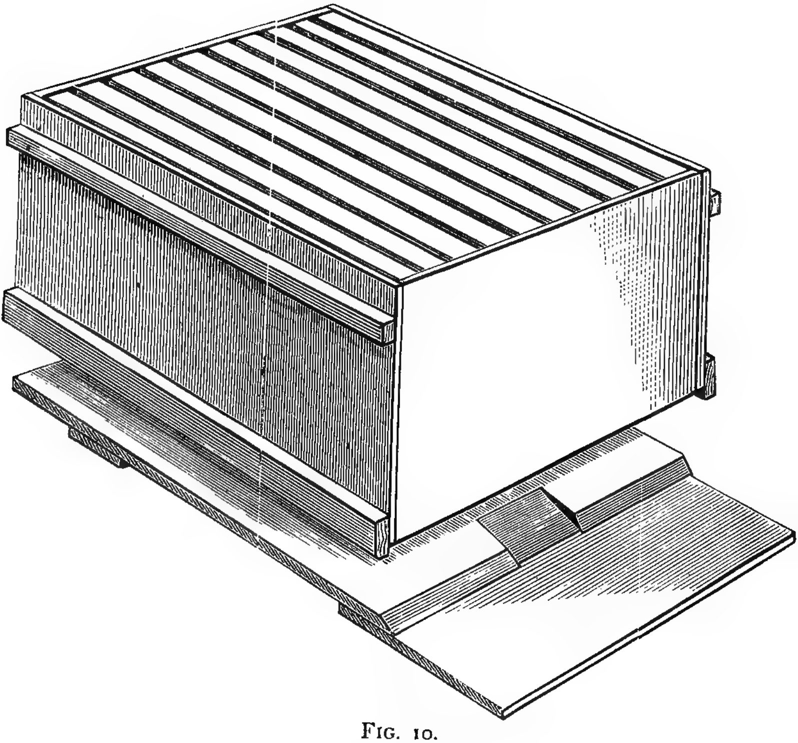


Fig. 10.
The Commercial Hive.

times over—it is interesting to find that Journal publishing the facts of M. Wimel's success in following my plan.

In the next number of the same Journal Mr. Crawshaw, then "almost convinced," said, "Here is strong evidence that disease may be controlled, if not actually cured, by systematic re-queening."

It is because this "great truth" is of such vast importance to the bee-keeping community, and is equally applicable in ensuring renewed vitality as the first element in the cure of the Isle of Wight disease, that I have shown how my position has at last been vindicated.

Failures.

As some bee-keepers have failed to effect permanent cures by the methods advocated, I find it necessary to give a few cautions. For instance, where the outer combs have not been used for breeding, or the bees may not have crowded on them, they have not undergone a thoroughly renovating process. This should be evident to any practical bee-keeper, and all combs should be exchanged so that each one goes through the brood nest while the young queen is doing her best.

Disease Reappearing in Spring.

Why does foul brood sometimes reappear in Spring? In addition to the above reason, the reader may have noticed that as soon as his bees become active under the influence of bright weather, they begin to clear out any dirty corner, or accumulated rubbish they find about the floor.

This is just where any lurking germs of disease may be hidden, and it points to the necessity of exchanging or thoroughly cleansing all hives if one wishes his bees to remain free from disease.

Micro-organisms and Disease.

It is a fact, not yet acknowledged by the scientific world, or the medical faculty—a fact, nevertheless, which I am in a position to prove by numerous examples—that what are considered the most deadly microbes in connection with various forms of disease can be entirely ignored, where a rational form of cure is adopted, and no medicine whatever need be given to the patient; the cure being more effectual, and the system at the same time is given greater vitality—as opposed to the weakening, and not seldom destructive, effects of powerful drugs.

What then becomes of the deadly microbes? Being simply an evidence, and not the "origin" of disease, they have no power for ill in the face of the healthy tissue established under a naturally regenerative system of cure. They are expelled both through the resumption of its normal action by that wonderful health preserver, the skin; and by the usual processes of worn-out matter passing off by the alimentary system. My final proposition (of a series published in 1898) in relation to bees will show what momentous changes can be created by developing a new condition of vitality.

Now, if microbes were the "origin" of disease, such cures would be impossible. It is, however, evident from the facts I present both now and hereafter, that micro-organisms are solely the "effect" of disease; though they may be, and often are, a cause of infection where a lowered vitality affords them encouragement.

New Light on a Dark Subject.

I am now presenting my readers with a number of propositions in regard to the origin, general development, and treatment of foul brood, from a thoroughly practical

standpoint; placing on record only such statements as are supported by sound experience.*

1.—*The origin of foul brood is found in a fermenting mass of neglected dead animal matter and excretions, combined with the presence of a weakened colony, breeding and feeding amongst and warming up to blood heat such neglected matter, which they in a deteriorated state are unable to remove.*

Ever since my very severe lesson experienced more than thirty-five years since I have held to this declaration as a truth to be maintained in the face of continued opposition, and more recently I have been pleased to notice that among my supporters I have Mr. McEvoy, the foul brood expert and Government Inspector of Canada, who probably has handled—and cured—more of this disease than any other bee-keeper.

Our scientific friends say at once, "Dead brood cannot turn into foul brood, and there can be no such thing as spontaneous generation." It is of no use replying that I quite agree with them. Dead brood as they think of it, may remain, and even rot down, and no disease such as foul brood need exist. But, if they will only follow my proposition to the very letter, they may have the same experience that I have done, they will have the same ending to their experiments, and a new light will enter their understanding.

Notwithstanding the expression has many times been thrown at me by prominent scientists, I need not support any theory of spontaneous generation, and until my critics will go over exactly the same ground that I indicate in my proposition—and none have done so—they cannot

* These propositions were first published by the Author in "Bee Chat" for 1898-9; and re-issued in the 1904 edition of "A Modern Bee-Farm."

conscientiously assail my position. They rely upon what they know, and what most of us have known since my lamented friend Cheshire's researches have been published on the subject, regarding the action of the *Bacillus alvei* as a "continuing" cause of foul brood. Thus what is only a cause of infection is erroneously looked upon as the origin of the disease.

Decomposed Animal Matter and Excreta,

when once gaining access to the food or water taken into the system of the living subject, has resulted in infectious diseases (micro-organic) from time immemorial.

It should be self-evident that only healthy tissue existed prior to the arrival of that disordered condition which primarily enabled the parasitic microbe to live and thrive upon it; *i.e.*, before there existed any other relative animal matter in a diseased state from which micro-organic infection could be carried. The same disease can therefore again "originate" in those combinations of matter acting in opposition to the laws of health, without any contact with existing infected animal matter.

One may build a new house, he may place there a family with no trace of disease for years before or after, and yet ultimately through some defect in sanitary conditions, that house becomes the habitation of disease, and a source of infection through the medium of micro-organisms therein developed. It may be the water is contaminated by the choking of a sewage pipe, but its contents nevertheless are the refuse of the inmates, and from them has been conveyed some hidden seed undiscovered and unsuspected until the suitable soil occurred for the seed to germinate and spread devastation around.

We may well consider that man carries within him hidden seeds of disease, which may or may not develop

into destructive germs according to his conditions of living or vitality. It has even been suggested that though in perfect health, within his mouth may be found disease germs identical with those accompanying that dreaded malady diphtheria. And why should not the unsanitary conditions presented by our proposition—the living, feeding and breeding among the rotting dead—why should they not, I say, result in organic disease? Then we have to admit that every colony carries within itself the primary seeds of disease which lie dormant while a natural vitality is maintained, and sanitary conditions are ensured. On the other hand, with the contrary conditions presented we arrive at the origin of foul brood, as distinguished from infection.

Foul Brood without Infection.

It is my intention to show that foul brood can and does appear in a district hitherto free from the disease without importation from any existing affected hives.

Nearly 40 years ago I had my first great battle with the dreaded destroyer. I should be correct in saying it was my only great battle with foul brood; for I fought, and conquered, and that too at a period when less was known about the complaint than at the present day. And from that time to this I have had only occasional experiences, solely with bees bought; sometimes from irresponsible people, whom I would be inclined to believe hardly knew what the malady really was.

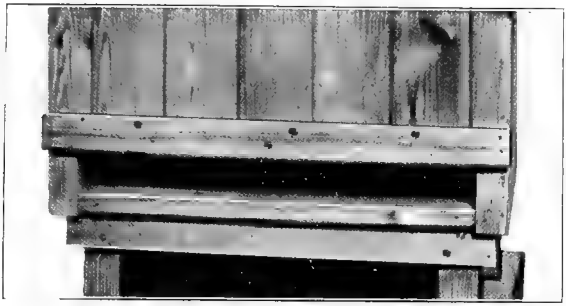
However, in my own hands, these cases were always isolated, and my original stocks were never contaminated. The diseased bees were very soon on nothing but healthy brood, and I have often had to regret, as I do at the present day, that I have no material wherewith to carry out further experiments.

My early experience was such a very severe lesson, that I cannot overhaul any hive, however crowded with bees, or combs crammed with brood, without catching sight of the merest speck of dead or diseased brood, and the value of the experience thus gained can well be imagined. My apiary at the time referred to was in a perfectly healthy district, and I was so careful during the prevalence of the malady among my own bees that it did not extend to the neighbourhood. I was in the habit of driving and otherwise manipulating the bees within a radius of three to four miles, and in no case did I find the least evidence of the complaint.

How then did the plague find its way to my own apiary? How indeed! Well, I was engaged in a business which did not permit me to give any of the usual hours of the working day to the bees. Honey had been coming in rapidly, and I thought to relieve the brood combs of the new honey, just as many another enthusiast with the wonderful honey extractor liked to do in those days; but unfortunately my operation was carried out with the rising sun just beginning to smile upon me, and if I had not been so preoccupied it is just possible I should have noticed him giving an approving nod at my industry, and a smiling whisper that "the early bird catches the worms."

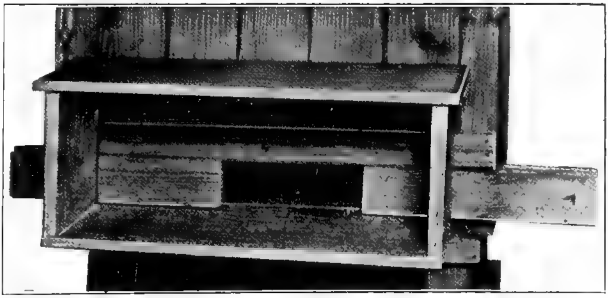
Anyhow my catch was something of quite an unexpected nature, and ultimately most industrious labor indeed was required to undo that early morning's work. I can see now, those beautiful combs of healthy brood, and I can also see how utterly impossible it was for it to remain alive after those incautiously induced revolutions during the chilly morning air. At the time, however, and for months after I did not consider the harm that might result, and was otherwise too much occupied to examine the

EXTENT AND CONSTRUCTION OF "CONQUEROR" ENTRANCE.



Full extent—2in. deep by 18in.

Showing entrance shielded by Stock-chamber, ⅜in. clear of front wall.



The Porch with deep slides.

hives. I eventually found the combs almost denuded of bees, and one mass of foul brood which by all appearances died immediately after the combs were passed through the extractor. As every comb in the respective brood chambers had been operated upon, the bees had become disheartened and could not remove so much dead matter, and after starting another smaller brood nest their efforts appeared to have been gradually restricted, until the conditions culminating in a state parallel with those set forth in my proposition, the combs were in the worst stage in which the disease of foul brood is known.

But how do I know this wholesale death-rate was the foundation of the complaint? *In the first instance the disease was found only in those hives operated upon during that early morning process.* It was first brought to my notice by another stock robbing one of the above, and henceforth foul brood was revealed to me. The robbing stock was the next to show signs of the disease. This was in early Spring; and then in one hive after the other specks of the disease began to show themselves. This, I have since found, was in some cases because I was not in the first place sufficiently cautious in cleansing my hands and implements after each manipulation.

Some of the hives within a few feet of those badly diseased, and whose brood combs were not disturbed at any time, remained perfectly healthy. The rest of the apiary was finally renovated by starting the bees on new combs in new frames, after the so-called "starvation" treatment.

I do not stand alone in my conviction that foul brood may originate in a district where hitherto it has not been known, and without being imported from an infected source. Mr. McEvoy, in particular, has offered much convincing evidence on this point, from extensive experi-

ence gained while carrying out his onerous duties as Foul Brood Inspector in Canada.

He gives numerous instances of foul brood resulting wholesale in large apiaries, hitherto free from disease, after being flooded so that most of the brood was killed, and the colonies of bees being so reduced, that after trying in vain to clear out the enormous amount of dead matter, continued to rear brood in small patches, until the usual result proved only too plainly that the living and the dead may not thrive and procreate in the same limited space without ultimately inducing an organic state of disease; the natural warmth, with its consequent fermenting effect being not the least agent in bringing about the final act.

2.—*The Secondary causes of foul brood are:* (a) *Robbing from an already diseased stock;* (b) *Carelessness on the part of the owner in working from an infected to a clean hive;* (c) *Mixing diseased combs and appliances with those of clean stock;* (d) *Feeding with diseased honey.*

My second proposition does not, apparently, contain much that is new, and most of the clauses considered are already established fact. It was, however, only in recent years that some of the more prominent scientists could be brought to believe that honey contained the spores of the *Bacillus alvei*. But there can be no doubt that honey has always been the most dangerous medium for the propagation of the disease; certainly it is the most tempting bait one may leave within reach of the olfactory senses of the bees, who are ever on the alert ready to appropriate that God-given sweet, even though the death-dealing touch of the dark angel may be upon it.

In years long gone by I have found repeated cases of disease being started in the previously healthy combs of colonies which had been traced robbing from a diseased source; and this has been quite a general experience.

The honey may quite possibly contain no germs of disease as it lies in the combs of a stock affected by foul brood, but it cannot be removed by "robbing," nor as extracted by man, without becoming contaminated; while the act of robbing in itself, because of the mad rush and searching into every cell by the marauders must result in contamination.

I next come to the question of carelessness in handling stocks. During my own experience I found no sign of the disease being permanently cleared off until that "extreme caution" born of repeated disaster and hard experience taught me never to work from *any hive* to another, whether infected or clean, without disinfecting everything used, including the hands, after each operation. A correspondent bewailing the unfortunate state of his apiary, in the most matter of fact manner states: "*Every hive I examined* became infected."

The mixing of combs and appliances may be carried out quite innocently, and often is done, before the apiarist is aware he has the disease. This causes a lot of trouble, and the owner of the apiary begins to think the disease is spreading from one stock to another with a lightning-like rapidity; when in fact, nothing could be farther from the truth. As in handling without care, so in this case it is simply a matter of infection by actual contact.

Feeding with Honey.

Feeding with diseased honey is a subject which requires careful consideration. I do not feed with honey, and have always condemned the practice as regards bought honey. One can never feel safe in using the latter for feeding, and candy offered as partly made with honey should be rigidly excluded from the apiary.*

* For many years the Author has used no honey in queen mail cages without it being both boiled and medicated. During 1912 many queen breeders in the United States adopted this plan.

The honey found in diseased stocks which are reduced to death's door, is seldom in sufficient quantity to be worth saving, and the combs should be destroyed just as they are in the frames by the one great purifying element—fire. On the other hand stocks not so far reduced may be made to use up their own stores (without daubing the extractor, and a hundred other things) in the manner I have already set forth, and by other means I shall later dilate upon.

3.—*The disease is probably never communicated without direct contact.*

I now come to a proposition that probably does set forth a new theory, which however I trust has already been reduced to fact by my own practice. During my severe trial of many years since, for two to three seasons in succession I had several hives standing within a few feet of others diseased, but for the reason that the combs of the former were built across the frames, having been purchased in that condition, they escaped ordinary manipulations, and were simply supered each year. Strange to relate, these stocks escaped infection, and the fact largely helped me in finally clearing the apiary, because I quite saw I had previously been the means of infecting further hives by not being sufficiently careful. I then had no hesitation in saving all the brood combs but slightly diseased, during the gradual decline of the malady, and I began to get the upper hand of it.

Partially Diseased Combs set over Queenless Colonies.

Thus one or two queenless stocks were made to take such brood combs as another stock would be completely renovated, and when all the living brood had hatched, those stocks were finally renovated and the combs

destroyed.* Then at last I knew once more the true pleasures of bee-keeping, and enjoyed the sight of all healthy stocks with the combs occupied by larvæ of the usual pearly whiteness, which denotes health, vigour, and an end to the long period of anxiety and losses.

I am convinced that the spores of the disease need cause no anxiety just because it is considered they may float in the air and would naturally adhere to one's clothing. I had another apiary some two miles from the one then suffering from the disease, and I would go straight from the infected stocks to this apiary, and make the usual examinations. My hands only had been cleansed, but during the whole period the said out-apiary remained perfectly free from the disease. I have stronger evidence to show you yet, that even the bees themselves do not carry infection by leaving their own diseased stock and entering a clean hive, but this will be explained in due course.

4.—*Bees flying from their own diseased hives do not carry infection to any point of contact with other workers, from, or in other hives, except only under the conditions of natural swarming; e.g.:* (a) *No disease is communicated from flower to flower in consequence of the visits of such bees.* (b) *No outside watering or feeding apparatus is thus contaminated.* (c) *A bee flying from its own (diseased) hive may enter a clean hive without danger to the latter.*†

In proceeding to give proofs in support of clause (c), I shall have shown sufficient to prove all other points contained in my present proposition.

Some of my most remarkable experiences occurred some fifteen years since, when I carried out an important

---

* After this early experience I found it was not necessary to destroy any but quite old or irregular combs.

† When swarming, the bees fill themselves with honey before leaving the hive.

experiment which entirely changed my own views as to the nature and destructiveness of foul brood; for whereas formerly I considered the combs must be destroyed utterly, I have been able to point to perfectly clean combs which were at one time diseased, *and yet they were not medically treated in effecting the cure.*

Exchanging Diseased Stock with Healthy Colony.

The said experiment consisted in exchanging places with two stocks; one of which was badly diseased, but strong in workers, old and young, while the other was more backward but perfectly healthy.

And the result! Well, it will astonish the reader to know that the healthy hive remained perfectly clean, though it received the whole of the working force and a great number of the younger nursing bees of the diseased hive. But throughout this experiment it is to be distinctly understood *the bees were not first smoked or in any way intimidated*, so that the normal condition of the workers was not upset in any way. They did not therefore gorge themselves with honey—but the workers in the fields from the diseased hive returned to the clean hive then in its place.

Queenless Interval by Swarming.*

The next case was simply one of *increasing* from a badly diseased hive which had a native queen. At the middle of a warm day the hive was lightly smoked and the queen removed, so that she might be left in a clean hive on the old stand, with foundation in the frames, to collect the flying bees. They were given one frame of healthy capped

* By this method there is no loss of time, as in removing a queen from a stock without swarming, while young bees only are left on the diseased combs.

brood as well, while the original hive of combs was removed to some distance. The young bees in the latter were without a fertile queen for some three weeks, by which time they had one laying, from a queen cell given them. In the interval, honey coming in rapidly, the whole of the diseased matter was cleaned out by the young bees; and after the young queen started laying, everything continued so satisfactory, and perfectly clean, that another division of the stock was made in July. The first swarm continued to build up nicely, and no sign of disease was at any time evident. Turning a diseased stock into three strong and healthy colonies was certainly better than destruction.

This is only one example of others that were treated in precisely the same way—making healthy increase instead of destroying the original; but it must be borne in mind that no bees were shaken from the combs, the whole hive was removed with as little disturbance as possible, the operations were carried out with stocks before they were allowed to become seriously depopulated; the time was favorable for swarming and rapid honey-gathering, and lastly, but almost more important than all, there remains the fact that the diseased combs were covered with none but young bees, and these being queenless for a period, cleaned out every vestige of the disease before the young queen again made up a brood nest.

The reader should make a note of this last fact in big capital letters, for I have never known Italian or Carniolan bees (with a virgin queen) when fairly numerous, to refuse to clear out all evidence of disease during the active season of honey gathering. Nevertheless, our scientists are puzzled right here. Even though they be witnesses of the above facts, they will still adhere to a theory of the indestructible nature of the foul brood spores.

There is a more simple way of disposing of foul brood spores than by boiling. *The principle of germination is at once their power, and, on the other hand, may be made the means of their own destruction.* It is simply a question of manipulation by the bee-keeper at the right moment, for, strange as it may appear, the above results were attained without medication in any form.

5.—*The spores of foul brood need not be dreaded, as they may be destroyed by a most simple and efficacious process, which is that of causing them to germinate where such germs find no congenial soil; as also where a suitable antiseptic then immediately acts upon the successive germs so that they have no power of reproduction, or of maintaining their own existence.*

The spores are considered by scientists to be indestructible; they will not freeze, no heat less than actual fire can kill them, no germicide destroys them. This is the theory to which prominent teachers adhere; they will tell you of "cultures" made in various substances in sealed tubes; they will explain how the *germs* cannot exist where certain medicinal agents are introduced, but do what you will, no germicide, they say, will destroy the *spores.*

These writers, nevertheless, not only deceive themselves, but are like the blind leaders of the blind, and in following this theory teacher and student alike fall into the pit of destruction together. If these teachers would only realise that a *cold culture* will not readily cause the spores to germinate and thus meet their prepared destruction they would then see how far they are from giving material aid to suffering bee-keepers.

It is an error to teach the indestructible nature of the foul brood spores, for in that they readily germinate in the living temperature of the populous hive, they are easily disposed of in detail, and therefore, with a little assistance, the fairly strong colony will have no more of

them. Only cause the spores to germinate where the said germs find no means of continued propagation and sustenance, and there is an end of them.

I have repeatedly proved by practical demonstration, in fact, and in results, that a fairly strong colony will, under certain conditions, give no resting-place to spores or germs, either with or without the aid of medicinal applications.

Look at the method employed by Mr. McEvoy, of Canada. The original combs are all removed, the bees brushed back into the same hive where they are not confined, but having been supplied with frames containing starters only, are allowed to remain three days, and build what comb they will. The whole of this is then removed and the bees placed straight on to foundation. The hive is not, neither are the bees, disinfected, or fed with medicated food ; and in not one, but in thousands of cases, has this treatment resulted in a perfect cure. Where are the dreaded spores ? Surely the bees should have been scalded if the scientific (?) opinion holds good as to the otherwise impossibility of killing the enemy.

Mr. McEvoy considers the bees use up all the diseased honey they have in building the new combs during the three days. Possibly they do, but the probability is that when shaken from them they still have some of the same honey, though this is apparently all used up before the foundation can be used for storage. Even then it is some few days longer before larvæ make their appearance. But, again, asks the scientist, what becomes of the spores? The fact is, in the meantime they have germinated without the means of reproduction.

I must also consider the so-called starvation plan, which is very similar to the above, except that the bees are confined without the means of comb-building for some

48 hours. And, again, what becomes of the great enemy? for without giving any medicated food, in years gone by, I have often cured in this way. There can be only one reply to the query; the act of cure is the same in both cases.

I come now to the apparently more intricate cases as presented in problem 4, where the disease was not only once, but repeatedly disposed of without destroying the combs, without medication, and with no manipulation of the diseased cells whatever.

Interval without Laying Queen.

There was in each case granted an interval of two to three weeks without a laying queen, during which space of time the population being numerous, and honey coming in, all the diseased matter was disposed of. Even then we have been taught to believe the bees could not dispose of every cause of infection. But what are the facts? The bees having thoroughly cleared out every particle of the soil suitable for the germs to thrive in—*and this they will not so readily do all the time they have a laying queen*—any spores left in the hive were bound to germinate where there was no soil to support them, therefore their existence terminated.*

Consequently we now see that the spores which might remain indefinitely without germinating in a comb *removed* from the genial temperature of the hive, are as it were, under a forcing process while remaining there during the active period of summer. Moreover, where a suitable remedy such as Izal is used to combat the disease, it

* It has been demonstrated by careful experiments that while no extent of cold will kill the spores, that repeated boiling may with difficulty do so—when diluted in water at about 60° they perish in less than six months; while germs, when so diluted, will be destroyed by placing them in the sun for a few days.

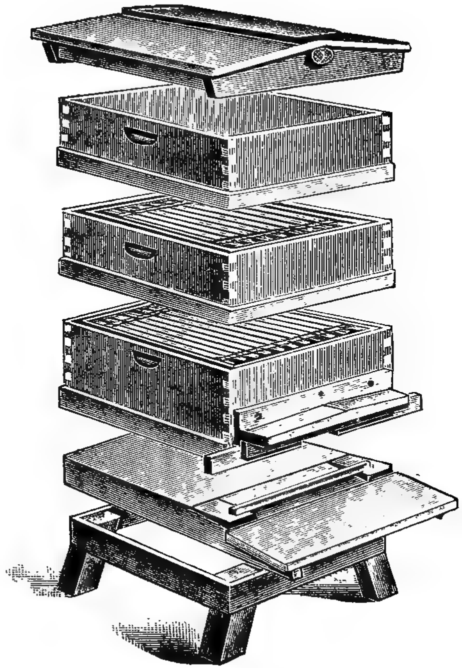


FIG. 11.

W.B.C. Hive as used for extracting. (Electro per favor of Messrs. Lee & Son.)

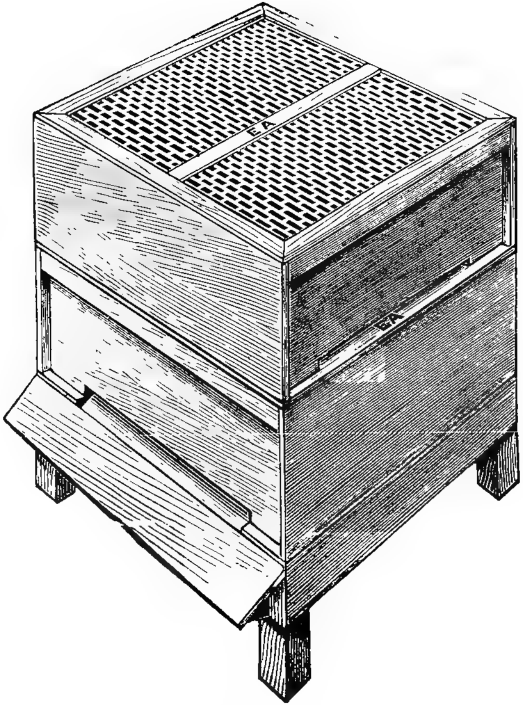


FIG. 12.

Economic Hive and Stand, showing how to work two or more queens on the tiering plan; also the method of dividing a stock, so that the swarm (natural or artificial) may be started under the stock. (Block as used in the 1893 edition.)

acts in the presence of brood in a manner similar to the removal of brood without medication. In each case the germ reaches a finality without reproduction ; *i.e.*, without the means of propagation, and because there is no soil for its further development.

Foul Brood Correctly Named.

Every experiment resulting in a successful cure goes to disprove the theory that *Bacillus alvei* is, as some will have it, a disease of the bees. Take away the brood, or the means of continuing its production, and behold the bees need no medicine to cure them, while they are almost at once capable of tending a perfectly healthy brood nest, and of keeping it so. Then again the germs of disease, when present in the bees, are only to be found in comparatively small numbers. The soil is not suitable for rapid development, and should a worker die, the extent of its malady is confined to its own body. In the workers the disease does not pass from the dead to the living. In the larvæ that is its most terrible means of infection.

The same state of restriction is found in the case of the queen ; for I have on numerous occasions during many years' experience, given queens from diseased stocks to those quite healthy, and on no single occasion have I found the complaint communicated by so doing.*

Moreover, there is the fact of the exchange of stocks before mentioned. Not only were the large number of workers of all ages from the diseased hive incapable of transmitting the complaint to their new nursery, but the same bees rapidly built up a weak into a powerful colony. The saving clause was that they arrived there without

* Nevertheless, it is possible a queen removed from a very badly affected stock may be the means of infection when given to another.

being frightened, and so did not first gorge themselves with their own stores.

Honey and Disease Germs.

It would be strange indeed if honey in a foul broody hive did not become contaminated to a slight extent. But here again the spores have no suitable soil wherein to extend their numbers, which therein are comparatively small; many investigators having been unable to discover any. This is not to be wondered at, for the humid summer temperature of the hive must cause them to germinate in detail, only to end their existence, for not only is there nothing in honey to encourage such parasites, but rather is it a substance detrimental to all disease germs, and in many cases a strong antiseptic in itself.

Abortive Germination.

It is well known that the seed germs of all plant life may be induced by warmth and moisture to make an abortive attempt at development, even when no soil is present to encourage further growth. The greater the heat and moisture the more rapid is the germination; and so also is their extinction more quickly ensured in the total absence of nourishment. The very few exceptions where plants may scrape a living on air and bare rock do not alter the general rule.

Boiling Honey.

Now it is a question if, after all, the act of boiling really does destroy the spores. The proof seems evident and simple enough that it does not. In the first place the process of applying heat alternately with cooling, is absolutely necessary. If boiling would do it the first application would be sufficient, but that is not so. It appears to be simply a question of germination, while the

said germs are destroyed as they develop under this process.

Consequently we have but one evidence of fact; and that is the spores simply germinate during the intermediate temperature, the germs being destroyed at the next boiling, and the boiling being followed by further germination, and so on till the process is completed. The logical conclusion, then, is this, that (*a*) the spores of foul brood may exist *indefinitely* in combs or honey stored apart from the bees; (*b*) they *must germinate* rapidly among clustering bees during warm weather; (*c*) the germs can only *increase* by the alternative process of reproduction* in dead animal matter; and lastly, where the temperature is favorable for germination without the means of reproduction the end of the disease is reached.

6.—*The presence of foul brood in a hive is an evidence of low vitality.*

How do we know this? The facts supporting this proposition are unassailable; and they are numerous. In the first place I will call attention to the opinion of nearly every writer who has had any acquaintance with the disease. All agree that the complaint is most virulent in the early spring. It gets a hold of the colony hardly before it is aroused from its winter's slumber, while the workers have as yet no incoming stores, and what little activity is apparent is only intermittent, such as the brighter intervals of sunshine tempting a few of the workers to gather fresh supplies of pollen. Otherwise the bees sit quietly upon the combs covering the slowly developing brood nest; and though only specks of the malady at first appear, long before general activity is

* Spores to germs, and germs to spores; or, seeds to plants, and plants to seeds.

aroused the brood may be half dead and putrid, while never a bee has attempted to remove the foul matter.

But, you go one fine morning to the apiary later in spring, and the bees are tumbling over each other in their hurry, while many are so loaded as to reach the entrance laboriously. Ah! that means honey, natural excitement, new vigour and vitality! Watch now the combs from day to day of any colony that has not become utterly depopulated. There will be no further extension of the malady, but first a restriction, then a decline, and with such manipulation as I have already offered my readers, finally a complete cure. Indeed, what disease can stand in the face of a renewed life, a greater vitality built upon new food which is creating such active tissue as bids defiance to disease germs.

A Rest from Brood-rearing.

Then again, suppose you remove the queen, not because she may perpetuate the disease, but just to give the workers a rest, for there is nothing in any state of life so wearing as the giving of one life for another, in driblets, as it were. After such removal the bees, soon having no nursing to do, turn their attention to cleaning out the foul cradles, and presently everything is so neat that one would never imagine disease had so recently lurked in many of the cells. Of course, a queen-cell must be given them, and if this is done during the active season, the improved tone and vigour of the workers is such that the brood nest shortly developed by the action of the young queen, is proof against further inroads of the disease.

Renewed Vitality—Basis of Cure.

Nevertheless, though I have shown that in such cases a rousing activity will always end in a cure, I do not by any means advise such attempts to be made by any but

experimentalists, without the free use of Izal, in the manner I have frequently set forth, as success is then doubly assured.

Former failures with Cheshire's remedy, and others that have been brought forward from time to time, have resulted largely *because this great principle of vitality has not been first raised* before the operator started in his attempt to cure. What did Cheshire do? The stock he operated upon was so nearly depopulated, as well as being queenless, that as a matter of necessity, before he could proceed at all, he added a comb of healthy bees and brood with a new queen. Here then was the real foundation of his cure, and without knowing it himself, he was both misleading himself and others who attempted to follow him, inasmuch as he pointed out that Phenol was the cure, and that alone.

In concluding this chapter I must assure the reader that disease among bees can only become a serious plague where it is not discovered early, and is allowed to run riot by the non-observant bee-keeper. Neither infectious paralysis nor any other bee-disease is to be feared by the careful bee-master, who gives immediate attention the moment signs of any malady are in evidence. The successful bee-keeper's policy will not be to "drift," but to *ACT.*

The so-called Isle of Wight disease (Infectious Paralysis) may be successfully treated by the definite methods of cure advocated by the Author. These are: (*a*) change of queens after an interval; (*b*) the addition of healthy bees and brood to weak lots; (*c*) feeding rapidly with properly medicated food, especially before winter; (*d*) saturating the bees with efficiently medicated warm water; (*e*) the Author's method of vaporising; (*f*) dressing insides of hives with Veterinary Izal; (*g*) effectual ventilation; (*h*) the use of practically immune bees.

CHAPTER XI.

BEE-PARALYSIS.

Isle of Wight Disease; Paralysis from Poison; May Disease; Dysentery; Overheating; Bad Ventilation.

THE general cause of Paralysis in bees is to be found in the insects' inability to breathe freely and fully, in consequence of the spiracles and air sacs becoming congested, and rendered useless for the time being, either by local poisoning, bad ventilation, acute dysentery, or, it may be, the action of some obscure disease germ * as in the case of infectious paralysis (Isle of Wight disease), with its consequent constipation.

It is all too frequently forgotten that the dark and

* In one issue of the *British Bee Journal*, the editor, describing acute dysentery, concluded this was the same as Isle of Wight disease. In a following issue, referring to *Nosema apis*, he again assured his readers this was the same thing as the Isle of Wight complaint. Nevertheless, in the said editorial it was shown that on the Continent bees are not apparently affected, and continue as vigorous as usual, when *N. apis* is present.

offensive contents of the bowel are not the primary cause of the disease and inability to fly, but the ultimate result of the malady. It may be concluded that neither acute dysentery nor *Nosema apis* is the cause of the so-called Isle of Wight disease, although in the case of general debility and loss of exercise *Nosema apis* may be present in larger numbers than usual.

Hence the cause should not be sought in the bowel, but will probably be discovered in some other important organ of the insect. In the earliest stages of the disease, bees incapable of flight may be found in front of the hive, with the abdomen free from pollen or offensive accumulations, and it is only after confinement through stress of weather that the dark-colored masses are found.

If the complaint is a disease of the bowel, then neither queen, drone, nor brood would escape; whereas it is generally found that only the adult workers are diseased. In rare instances, however, it may be considered that the queen is affected, and will be unable to continue her maternal duties. The drones appear to be only occasionally found under the spell of the disease, though, being so robust and stronger on the wing, the affection does not seem to be serious in their case.

The Early Stage of Infectious Paralysis

may be noticed by the following symptoms: bees falling before the hive entrance, clinging to grass or clustering in lumps, unable to take wing; *no dead except from continued exposure*; in a period of fair weather the abdomen is free from dark or offensive matter; no dislocation of the wings; no inclination by the stock to discontinue work in fine periods; falling bees will often put out the sting if touched; no discolored or bloated bees found clinging to the frames, combs, or anywhere inside the hive, in a helpless condition;

the first evidence of the malady may occur with a sudden accession of heat * ; *may also be seen soon after giving fresh sheets of foundation.*

The Secondary or Final Stage

is a more serious matter, and should not be allowed, if possible, as the observant bee-owner should generally be able to check the complaint at the first evidence of trouble.

The sick workers now die in the hive, or are found expiring on the alighting board, or in front of it, many being drawn out by the more able workers, who may soon be in like condition. Few or no bees crawling or clustering on the ground ; the abdomen not of necessity distended, though more frequently so in cool weather ; contents of the bowel generally offensive, but not always of a dark color ; workers die off quickly, many becoming denuded of hair and turning a dull black while yet alive,† hence the complaint has been referred to as *Bacillus depilis.* The stock shows less inclination to work in fine weather than formerly. The sick bees are constipated in all cases, except it may be occasionally in winter, when they are unable to hibernate perfectly. The affected bees have neither the power nor the inclination to use the sting. At this stage of the malady even quite young bees may be among the dead. The dislocation of the wings, so often referred to, is not peculiar to this complaint.

Curative Treatment.

Many prominent teachers, and also experts holding first-class certificates, have allowed the bees they owned, or

* Where losses occur in autumn, winter and spring, the disease probably developed in the previous summer.

† These should not be confused with old, lean, dark bees that the workers may be turning out from some hive, often a vain undertaking, as these will frequently fly back.

those under their charge, to die out through sheer helplessness and incapacity; or have destroyed other stocks in a panic of fear, and ignorance of the true principles of recuperative and life-giving vitality.

These and other bee-keepers have allowed lethargy and decay to reign supreme, where otherwise they might have secured increased vigour, and a rousing vitality that would have ensured a large increase and more profitable results.

Many writers whose experience is limited by their own failures, insist that the disease is incurable, despite definite and conclusive facts to the contrary.

Definite Treatment Ensuring a Definite Cure.

In the successful treatment of foul brood I was able to show, many years ago, how the affected stock could be renovated by a change of queens after an interval, as well as by the addition of healthy brood and bees; and the reader may rely upon the Author's statement, as a fact beyond all controversy, that the removal of the original, and more particularly if an old queen, and then introducing

A Vigorous Young Queen,*

when paralysis is found during the active season—as a virgin after seven days, or a fertile queen after fourteen days—will ultimately result in a complete cure, where supplementary treatment herein recommended, is also carried out.

The Links in the Chain of Disease

are severed by the period allowed between the lives of the older workers, and the renewal of the population by the addition of numerous young from the vigorous and

* The young queen should be either Italian, Carniolan or Cyprian, if the latter be crossed with a drone of either of the first-named varieties.

youthful queen; while the workers produced by her are of a more hardy constitution.

I frequently hear from correspondents whose apiaries are free from disease, largely because of the *yearly renewal* of young queens * and the persistent use of medicated food,† while neighboring apiaries, in some cases just over the road, are being ruined by the Isle of Wight or other complaints.

In Spraying the Bees and Combs

with the Author's preparation, it is not sufficient that the operator use the common rubber spray, which is quite inadequate for the purpose of saturating them short of drowning the bees. A fine-spray syringe should be used, damping the bees thoroughly to just that extent they will not crawl away from the hive. The combs need not be shifted, except in the secondary or fatal stage of the complaint, when every comb must be saturated on each side. The quilt must be quickly replaced after spraying over the tops of the frames, the whole operation being carried out in less than three minutes. The bees will at once start a merry hum, while busily cleaning themselves and each other.

Steaming or Vaporising

may be adopted, even in cool weather, using a small kettle with a rubber tube passed under the quilting. Apply for three to five minutes, using double the quantities of Izal, etc., as set out for spraying. This plan is very useful when supers are on.

---

* The annual renewal of queens has been persistently advocated by the Author since the issue of his 1886 pamphlet, and many have benefited by following this plan.

† In using Izal, one teaspoonful to one pint of water is necessary for spraying, or two teaspoonfuls of B-well." For feeding, use the same proportions to 8 lbs. of sugar.

The Enamel quilt, or American oilcloth, is finally condemned in view of the prevalence of bee-paralysis. Nothing must check ventilation, and all corroded quilts should be removed and clean ones returned after being saturated with the B-well solution, and left wet.

Out of Season Applications.

The foregoing plans can hardly be carried out from the end of October to the end of February, but at any time during winter, when fairly mild, if it is absolutely necessary, just two or three pounds of medicated syrup may be given to an affected stock.

This food should be quite warm, and supplied in a plain bottle having a double thickness of thin old linen, or cheese cloth, tied over the mouth, inverting it close on the bare frames, just over the cluster. The bottle should be carefully covered up, and applied so that the whole of the food is taken down while warm.

By the end of February, if mild, thin medicated syrup (warm) may be given with great advantage, allowing one-fifth more water than for early winter stores.

Early Autumn Treatment Imperative.

Where the bees are already in a bad state in Autumn, the case is somewhat difficult for the average owner to deal with. A young queen should have been given in August; and if the stock is already depleted, a comb of brood and healthy bees will work wonders, if such can be spared. The added bees are not readily affected, particularly if preventive measures are being employed, and these fresh workers quickly re-invigorate the stock, ensuring a populous colony.

Natural Stores Condemned.

Where there is any possibility of disease, either in his

apiary or the neighborhood, no wideawake bee-keeper will in future leave his bees with natural stores for the winter. One may not say, "That is well enough, I'll leave it alone." I assure you it is not well enough, and you may not leave it alone, if bee-paralysis is anywhere near you.

The stored honey must as far as possible be removed,* not that this may be a source of danger, but because the careful owner must make up his mind to feed his stocks with efficiently medicated syrup. In this way the bees have only medicinally prepared food to live upon, and are thus able to keep free from disease. Stocks not so treated are frequently found to be failing with the Isle of Wight disease in late autumn and winter, when any sort of manipulation is out of the question, and it is then too late to change the stores.

These points were advanced by me in the *British Bee Journal*, August 24th, 1911, and more particularly insisted upon in that Journal for September 5th, 1912, as a helpful warning, so that bee-keepers might certainly avoid the usual winter losses from this complaint. I showed that

The Bee-owner's Great Opportunity

occurred in the Autumn, and if my advice as to feeding up with medicated food was followed, I declared it to be *a fact that winter and early spring outbreaks need never occur.* Many have already profited by this advice, and at last bee-keepers generally are beginning to realise the above truth. The process of cure is always hastened by the addition of a young queen, clean brood, and healthy bees, when available, even if only as many as will cover a single comb. Another point is that feeding with medicated food

---

* With a July reared queen inserted in August there will be no difficulty in turning much of the natural store into young bees, before finishing by rapid feeding.

should recommence from the end of February, as the essential curative principles of any germicide stored for several months in the food either evaporate or become weaker.

The partial success of a writer in the *British Bee Journal* of April 24th, 1913, who followed the plan of wintering on medicated food, is to be explained by the facts set out in the preceding paragraph.

Sources of Danger disposed of.

An essential feature is that young bees must be produced in September in sufficient numbers that the old stores of pollen, etc., are largely disposed of; as also the old bees that are another source of danger.

Adding Driven Bees.

Where brood is not available, the reduced stocks may be made up with driven bees if these can be procured locally, or from not too great a distance. In all cases the bees should be fed up rapidly with medicated food. Human beings can be treated without medicine, but bees living in such vast numbers and in close contact may not be managed in just the same way. Nevertheless I have always insisted that recuperative measures are of as much importance as the best germicide, and should always be adopted in combination.

May Disease

is a malady sometimes mistaken for the Isle of Wight paralysis, but it does not appear to be infectious, and usually only the very young bees seem to be affected, and should these be picked up they are quite prepared to use their stings.

The cause is to be found in a sudden accession of heat just as a badly ventilated hive may be hatching a large

number of young bees; thus increasing the population so rapidly that the older workers may not be able to drive in enough fresh air; or they may be so busy gathering honey that they do not leave a sufficient number to do it thoroughly. It is quite probable that overheating injures the delicate gauze-like wings just as they are unfolding as the bee nears maturity, and hence the young thus affected will vainly attempt to fly.

The Cure for May Disease

is of course very evident, but with proper ventilation provided, the effect though certain as regards further young that may leave the cells, is not of much avail so far as the bees already affected may be concerned.

It is a very strange fact that the sudden advent of great heat will frequently show the first symptoms of the Isle of Wight disease in a stock hitherto apparently quite healthy, while others known to be slightly affected are immediately found to be in a worse state. Thus

The question of thorough ventilation*

is one that must be very seriously considered by every bee-keeper. In the above-mentioned rapid development of Isle of Wight disease usually only the adult bees are troubled, as distinguished from May disease, affecting the very young.

Paralysis from Local Poisoning

will sometimes be found to occur with bees that have

* This must not be confused with *excessive* ventilation in cold weather. A wide entrance in cool weather, exposed to wind is detrimental; but a restricted entrance and heavy quilting will always be fatal. A small entrance, with the quilts removed, will be beneficial. Swarms slightly affected may always be cured if hived with no quilting until ready for supering. See also "Swarming without Increase."

visited some injurious plant or tree that may be in bloom when there is not much else they can work upon. I have always advised the immediate and rapid feeding of several pounds of thin warm syrup, and this simple remedy has proved most beneficial, as the poisonous honey collected is diluted, and the bees have less inclination to work on the laurel, which is usually the offending plant.

Dysentery

will sometimes result in partial or temporary paralysis, and the trouble may result from the winter food being unsuitable; or because the bees have a damp and shady position, with prolonged confinement.

Spring Dwindling,

as usually understood, is not a result of Isle of Wight disease; indeed, it is not in any sense a disease, but is always an accidental circumstance, generally resulting from mismanagement.

Nevertheless, this or any other trouble can be aggravated by infectious paralysis; but it would be a wrong conclusion to set down spring dwindling or common dysentery as a result of this malady.

Where did Infectious Paralysis come from?

In the July, 1896, issue of *Gleanings in Bee Culture* (America), the editor expressed a fear that bee-paralysis was spreading over the whole of the United States; but fortunately such has not been the case, although the trouble has been reported by bee-owners in a dozen different States over a period of some 30 years or more, but especially in Florida, Texas and California.

Infectious paralysis has been known in Australian apiaries since 1894, at different periods, and there can be no doubt that less serious cases occur occasionally in other

countries. The trouble has sometimes been considered a form of dysentery, but it is not so, being essentially a case of constipation. The hives and combs are very seldom soiled, unless occasionally the bees are unable to hibernate because of the malady being aggravated by cold.

Means of Infection.

A whole list of most improbable causes has been given from time to time; the writers entirely ignoring the most simple rules of reasoning, and overlooking the fact that thousands of colonies existing under the same conditions have remained healthy and prosperous.

Poor and wet seasons can have nothing whatever to do with originating the disease, otherwise the complaint should have been with us before the late plague and more frequently in years past. Indeed, excessive heat, rather than bad seasons, tends to develop and aggravate the complaint where it is in evidence.

Pollen and honey-dew, as mediums of carrying the germs of disease, and also the practice of feeding sugar as a supplementary store, have also been considered causes of the Isle of Wight disease, but with no shadow of proof to support such theories, for the reason set out above.

And seldom can the disease be spread because bees visit flowers that have been searched by diseased bees,* otherwise other stocks in the apiary, or neighborhood, would not remain free from the complaint, as they certainly have done in many instances.

Contaminated water may be one means of spreading the disease, but undoubtedly the sick and dying workers lying around are the greatest source of infection to other colonies,

* It is even a question whether an ailing bee goes out to work when its condition of disease is so far advanced that it could thus disseminate the fatal germs.

as they certainly are to the other members of their own hive. Hence every sick or dead bee should be collected and put out of harm's way every day, or several times daily.

But probably the worst offender of all is the owner himself, if he is careless in manipulating, and in treading upon diseased bees. In working with affected hives the hands should always be kept moist with a strong disinfectant, as also the smoker and any other tools while in use. The ground should be well treated with chloride of lime, as well as the outsides of hives when the bees are quiet. The insides of all empty hives should also be treated in the same way, or by some recognised germicide, the most effective being veterinary Izal. Salt may also be freely used all over the ground; it may be sprinkled on the floors, and particularly near the fronts of the hives. It will also be beneficial supplied in syrup, and all known drinking places that the bees visit.

There is no excuse;

there is no reason whatever that the disease should spread through a whole apiary, and certainly far less reason why it should spread to other apiaries in the district, except from utter carelessness and incapacity.

Robbing

is probably another unfortunate means of spreading the Isle of Wight complaint, but even where this is found to occur the owner is entirely at fault should any evil consequences follow. The bees, as well as the stores appropriated, may be at once rendered harmless by spraying with the B-well solution, or with Izal. The advantage of supplying medicated food to all stocks will be evident in this case, as no serious result can possibly follow after robbing.

Rats, Mice, Ants, Birds,

and other creatures that stir up the dead in front of affected stocks, and then pass over the alighting boards, are undoubtedly to blame (next to the owner who allows such to lie about), in spreading the malady from hive to hive in the same apiary. Mice are particularly fond of eating bees; they live in the ground everywhere, and their name is legion. While the owner is asleep they are all over the fronts of his hives, carrying destruction to successive colonies, while he is dreaming of some mysterious means of infection, instead of awakening to the fact that this and most diseases are spread by direct contact—and that contact he may prevent.

Flowers and Water

should not be provided near the apiary. Even where there is no immediate danger the bees will soil many objects around the apiary, and it is best to be on guard against all forms of disease.

It is sheer folly to suppose that a given swarm of bees will store just as much surplus honey in a common skep or any old box or tub, as they can do in a bar-frame hive; or even that they may produce as much in a makeshift, incomplete frame hive, as they will in a properly constructed modern hive, built upon a comprehensive scale for carrying out the most economic methods.

Movable frames—large frames—and large hives admit of such manipulation that a given swarm may yield four to five times as much as it would do in a skep or makeshift hive.

CHAPTER XII.

MODERN HIVES.

HOW CONSTRUCTED AND FURNISHED.

BEE-KEEPERS who have failed to obtain good results from the use of modern hives are at times in the habit of comparing their poor results with better conditions they have seen, where the old straw skep was in use.

Nevertheless, it is not the modern hive which is at fault, but the bee-keeper who fails to carry out modern methods. The straw skep has severe limitations, and is in no sense, either for large populations, for wintering, or good honey results, equal to the modern bar-frame hive.

The Cowan Hive.

The hive illustrated (Figs. 7 and 8) is that adopted by Mr. T. W. Cowan many years ago, as an improvement upon the Woodbury, one of the earliest types of bar-frame

hives used in this country. The hive is self-protecting, and can be packed with chaff or cork dust between the inner and outer walls, and even between the double floor.

This was one of the most substantial and workable of the early pioneer bar-frame hives, and its constructor had considerable success with it. The hive was in use and was described by Mr. Cowan in the *English Mechanic* long before there was any Bee Journal in this country, and at a period when most of the prominent bee-keepers found the columns of the *Journal of Horticulture* one of the best mediums for the interchange of opinions and experiences.

Mr. Cowan, who was always a clever mechanic, was also the inventor of the Automatic Extractor, which bears his name, and is now almost universally adopted as the best machine.

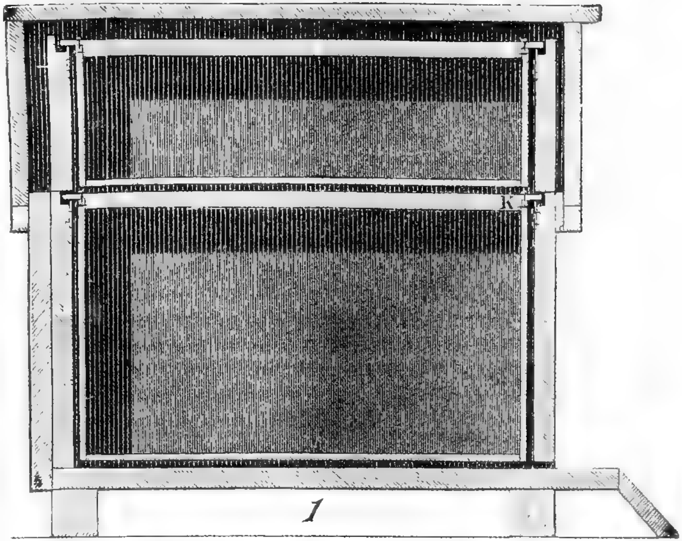
The Stewarton Hive

was one of the best known in Scotland in those days, but as it had only bars and slides, it had to disappear before the rapid advance of the more convenient hives, having every comb built within a separate, easily removable frame.

The Stewarton was apparently the first divisible brood-chamber hive, and was responsible for some large yields of honey, principally because of the method of management adopted.

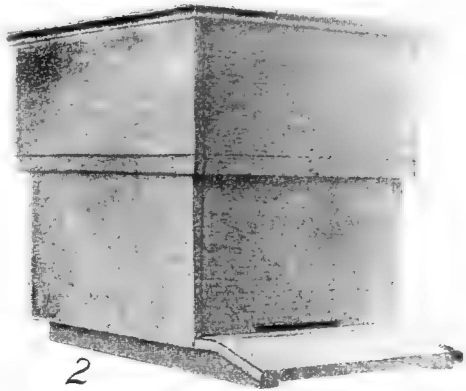
A swarm would be hived in a body box, with a super added ; then another, and often a third swarm would be added in another brood box below the first, or second, respectively ; while at the same time further supers would be placed above. The slides were at first drawn at the two sides ; with the added supers, more than two slides, and as the stock became established still more surplus room was given.

Pettigrew's large flat skep also fell into disuse, although

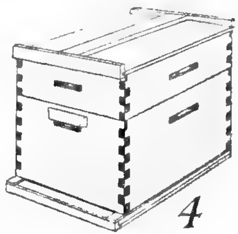


1

3



2



4

TYPES OF
AMERICAN
HIVES

he had been very successful in adopting a peculiar system of his own in connection therewith.

But the pioneer manufacturers of movable frame hives, Messrs. Neighbour, Messrs. Lee & Son, and Mr. Abbott, of the *British Bee Journal*, and a few others, were able to give a great impetus to the demand for improved hives at the Bee Exhibition held in the Crystal Palace in 1874, and with the *British Bee Journal* already started, and the British Bee-Keepers' Association inaugurated, modern bee-keeping methods rapidly extended.

Another hive came into notoriety when the late Mr. W. B. Carr became sub-editor of the *British Bee Journal*, bringing to the same office the *Bee-Keeper's Record*, which he had edited for many years.

The W.B.C. Hive

has perhaps been used as much as any by the many who require a cheap article ; but its principal feature and recommendation was its $5\frac{1}{2}$-inch frames for extracting.

The hive is not so substantial as the Cowan hive, and has often been produced too cheaply to be of any real value, and in a manner not creditable to certain makers.

The Abbott Hives

are generally furnished with frames having wide ends of wood as part of the frame-bar for self-adjustment.

Another feature in Messrs. Abbott's frames is the double groove in the underside of the bar for inserting the sheet of foundation, and then fixing with a slip wedge. This was an ingenious idea, and has been adopted by the largest manufacturers in the United States.

This plan of fixing foundation is better than the top bar split through and nailing, but for my own use I prefer wiring, and waxing the sheet to the top bar, as being more simple, strong and expeditious.

The reader will understand that the chief feature of the modern bar-frame hive is that each comb is built in a separate frame, enabling such to be removed at will without force, and without in any way soiling or injuring the comb. Each frame stands about $\frac{3}{8}$-inch from its neighbor, and $1\frac{1}{2}$-inch from the centre of one to that of the next, though this space may be varied to suit different requirements as hereafter shown. The frame rests only upon or in the hive proper by a lug or ear at each end, and a space of not more than $\frac{3}{8}$-inch must be allowed between the two end bars of the frame and the walls of the hive; while not less than $\frac{1}{2}$-inch should be provided between the bottom rail and the floor; or $\frac{1}{4}$-inch at the sides.

I present to the reader a simple hive with eleven frames, occupying a space across the case, inside, of $16\frac{1}{8}$ inches; and another hive with frames, equally as simple, but more complete, having an outer case, as shown in the illustrations of Simmins' "Conqueror," which was introduced to bee-keepers in 1888, as the perfection of his "Non-Swarming System" offered some years previously. Also a very practically arranged hive with frames 16 inches by 10 inches, the more suitable size for commercial, as indeed for all highly profitable purposes.

THE ECONOMIC HIVE.

This is a simple and substantial hive, made from $\frac{3}{4}$-inch deal. It contains nine frames and two dummies, and the width of the hive inside, measuring across the frames, is $16\frac{1}{8}$ inches. By removing the dummies there is room for eleven frames for ordinary spacing, or as designed by me for close spacing in the first instance, twelve may be used only $\frac{1}{4}$-inch apart. I have practised crowding and close spacing ever since foundation first came into use, finding

it gave a more compact brood nest and less room for stores below.

The same idea has since been brought forward in America, with the claim that it prevented the issue of swarms, as the bees would not, it was supposed, store in such shallow cells as this arrangement enforced, and on the other hand would be prevented from breeding in the thicker store combs (sections) above. In neither case, however, is this quite correct, as I have many times found that not only do bees store and cap combs which are even thinner than required for brood, but also that the thickness of the combs in sections above is not the least hindrance to the bees breeding there, as they simply reduce the length of the cells to suit their purpose should the queen be crowded by mismanagement below.

The Economic (Fig. 20) has a floor composed of one piece of board 17¼ inches by 11 inches, and another 5½ inches wide of the same length. The two are halved together, and a ¼-inch rabbet cut out round the upper edge to keep wet from settling under. Another 5½-inch board, bevelled on the edge, forms the flight board, and is detachable, being secured by simple hooks, or hinged, if desired; the object being to ensure that there is no projection in the way when packing and travelling.

The front and back boards are each 16⅛ inches long by 8⅝ inches deep. Both of these are bevelled along the upper edge, to give a thin ledge for the frames to rest upon. The two side walls are each 17¼ inches long by 9 inches wide, and overlap the back and front walls so far that exactly 14½ inches are allowed between the two, being ¼-inch to spare beyond the length of the 14-inch standard frame at each end. A plinth, 16⅛ inches by 2½ inches, is inserted at the top and bottom between the two 9-inch sides, filling in the space left at the ends of the

top bars, and at the same time being a very convenient arrangement for lifting the hive. The permanent entrance is 3 inches wide and cut out of the floor, but full width can be given by sliding the hive forward.

The Cover

is cut from 11-inch stuff as shown in Fig. 13; the long edge being 21 inches and the other $7\frac{1}{8}$ inches. The bevelled edges for mitreing at the joints may be cut off on the saw bench, or even better, by hand, straight from the plank in the first instance, reversing the plank at each cut. Otherwise, the inside edge should be gauged at $\frac{3}{8}$-inch, and then planed down to the mark, leaving the outside edge untouched. Nail together with at least five 2-inch brads down each side. The top square is 11 inches across and screwed on from inside. There is no economy in planing the wood other than on the outside; but where this is not done it requires very much more paint, and is liable to rot, as the surface cannot be so well covered.

The Standard frame and dummy are as represented, Figs. 14 and 15; the top bar of the former being $\frac{3}{4}$-inch thick instead of the usual weak bar of only $\frac{3}{8}$-inch thickness. The top bar may be either $\frac{7}{8}$-inch or 1-inch wide, the former being generally adopted.

All covers must be painted on the lower edge and 2 or 3 inches up underneath as well. The floor requires painting at least 3 inches from the edge all round both top and bottom, as also the bottom edges of all compartments. This is too frequently omitted, when the hive does not last a fourth of the time it should. So long as all in sight is painted that is generally considered sufficient, whereas the very parts left undone happen to be the most vital, as it is at the joints that the wet settles and soon causes mischief.

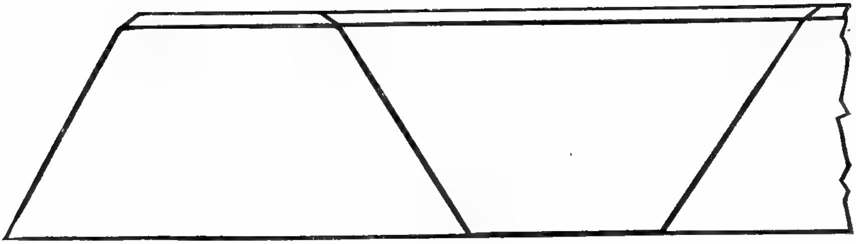


FIG. 13.

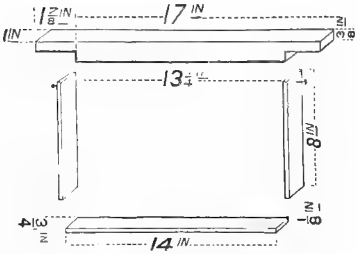


FIG. 14.
Standard Frame.

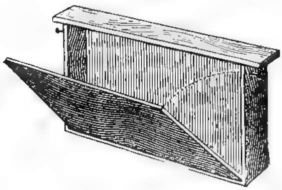


FIG. 15.
The Author's Original Feeding Dummy.

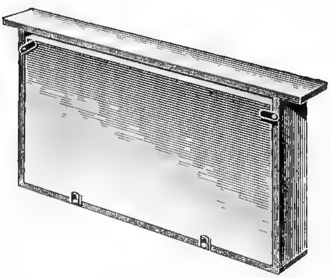


FIG. 15A.
The Author's Improved Dummy Feeder.

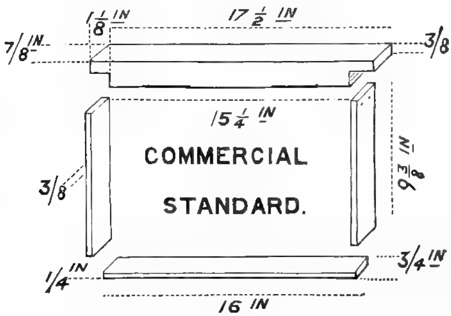


FIG. 16.

Simmins' Thick Top-bar.

Having used a top-bar from $\frac{3}{4}$-inch to $\frac{7}{8}$-inch thick for more than 30 years, during the whole of which period I have strongly condemned the thin $\frac{3}{8}$-inch bar generally manufactured by hive-dealers, I am so strongly convinced as to the superior advantages of the thick top-bar that I must urge all to use no other.

The thick bar is not so readily built over by the upward extension of the comb, while I have frequently pointed out that the queen is less likely to travel over it into the supers, hence one reason why excluder zinc may be dispensed with. I have carried out so

Many Experiments with Frames

in various styles that my readers may be assured the plain frame $\frac{7}{8}$-inch wide is the best to adopt as herein illustrated. Top-bars varying from 1-inch to $1\frac{1}{2}$-inch have repeatedly been tried, only to be discarded as non-practical, except in the case of shallow extracting frames, which may have $1\frac{1}{8}$-bars and be spaced at $1\frac{3}{4}$-inch. Frames with wide ends for stock purposes should be barely $1\frac{1}{2}$-inch.

SIMMINS' CONQUEROR "HANGING-CHAMBER" HIVE.

In hive construction I presented in my 1893 edition the very novel feature of whole bodies HANGING as do the brood frames, and notwithstanding the clear bee-space allowed all round between each upper and lower rim of the respective boxes, the sections are carefully secured against cold by the judicious arrangement of the quilting; while upward ventilation around the sides may be allowed or entirely prevented at will, simply by the careful adjustment of the same. The section crates are further secured against chill by double packed sides.

This hive, which I had under serious consideration when my Non-Swarming System was inaugurated,* is in many important particulars quite different to any yet introduced. My method has been before bee-keepers for many years, and has met with approval from all who have followed the plan intelligently; but so many of the hives in use are unsuitable for carrying out the method, that the novice has often found it difficult to adopt with the hives he has on hand.

All Chambers a Bee-space Apart.

I therefore introduced during the season 1888–9 the above improved Non-Swarming Hive, which gives (1) plenty of room in the right direction, (2) perfect ventilation at all seasons of the year without draught, (3) the most complete shade during the hottest days of summer, (4) the greatest ease in manipulation, as the lower body may be examined, also the upper, or brood nest proper, QUITE INDEPENDENTLY OF EACH OTHER, also without removing the supers. The latter points in particular, will be welcomed by many bee-keepers, who, while anxious to examine the brood nest or non-swarming chamber under it, frequently neglect to do so rather than be obliged to shift the whole lot. For a period extending back prior to 1875 I have had hives in use having a deep outer case, and from these my best results have invariably been secured.

Within this Hanging-Chamber Hive we have first the lower chamber (whether shallow frames or sections, or a second stock hive arranged for prevention of swarming) which touches neither the floor nor stock chamber proper above it, thus entirely doing away with propolisation at these points, and enabling such non-swarming arrangement

* Special Prize Hive, South Kensington, 1878, Simmins' Non-Swarming Pamphlet, 1886.

THE AUTHOR'S "TURN-OVER" METHODS.

First published in the 1893 edition of *A Modern Bee-Farm*, and the Double Conqueror Hive for its better working in 1894; all chambers being under one shelter. Every variation in uniting or dividing is carried out without any complicated apparatus; the usual entrance slides only being moved. See illustration No. 4, opposite page 224, showing dividing panel.

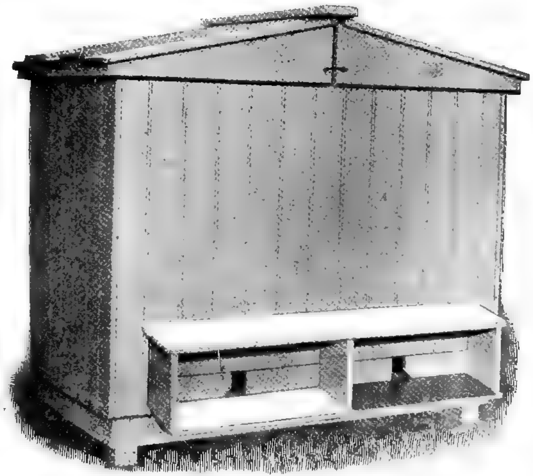


FIG. 17.

The Double "Conqueror," arranged for starting two stocks, Nuclei or Swarms, having a Double Porch both back and front, with one long slide and two short ditto.

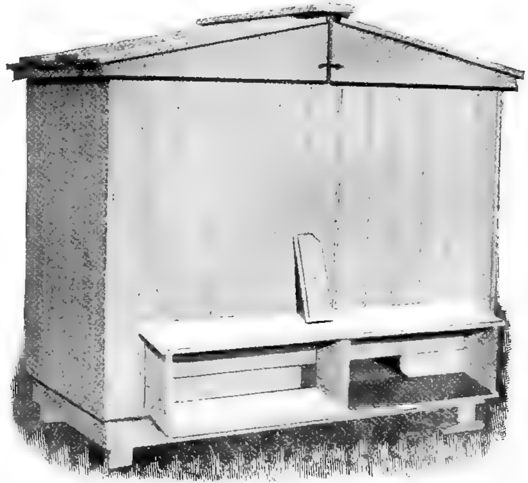


FIG. 18.

The Double "Conqueror," with entrance closed one side, the working force being turned over to the other side. The bees returning to the left side now pass behind the upright and enter the entrance on the right.

to be examined with ease at any time. The brood chamber comes next, and on this the supers may rest if desired. The hive is also used with neither of the supers or chambers touching its neighbor, either for extracting or comb-honey production. The hive was set up either for comb-honey or extracting ; with a deep stock and shallow supers ; with all standard stocks for extracting ; with a divisible brood chamber of all shallow frames for extracting ; or a combination of shallow frames and sections.

Room is allowed for three to four sets of sections where one is first worked under the stock in place of another body of frames. The hive proper is capable of holding either eleven or twelve frames, while the lower chamber will take as many more. For extracting, another takes the place of the sections, so that in all, nearly three dozen standard frames may be used for that purpose ; or eleven stock frames and 24 to 30 for extracting, when these are shallow.

The side walls of the body boxes are of the same depth as the frames, yet the space between the respective chambers is so carefully regulated that the distance between the several tiers of frames never varies. There are no two level surfaces drop upon each other anywhere about the body boxes or supers, and therefore very little propolisation, and less risk of crushing bees.

Notwithstanding the open space between the lower and upper chamber (and the other compartments when so arranged), and around the same, it may be as well to meet any enquiry regarding this arrangement by at once stating that where the surplus is properly looked after, and the super of sections is started below with full sheets of foundation, and the entrance contracted meanwhile for the purpose of encouraging work there, no combs can be built outside of the chambers.

The Large Entrance Accommodation

is a great feature in Simmins' Hanging-Chamber Hive; in summer it may be some 18 inches by 2 inches deep. Next we have the independent space all round the lower rim of the Non-Swarming Chamber (as temporary super) and between it and the floor, a further opening of 70 inches by $\frac{1}{2}$-inch. But more than this, taking the upper spaces between three other chambers, we get another clear spacing equal to 210 inches by $\frac{1}{4}$-inch deep, or a grand total of entrance accommodation of over 120 square inches. The fact cannot be denied that such a feat has never before been accomplished in a modern bee-hive, in solid workable practice, and with results in honey-production far in excess of the restricted, non-ventilating methods still adopted by the majority of bee-keepers.

Perfect Ventilation

cannot be secured in any other manner, either in summer or winter. Many of the old bee-masters have striven to secure thorough ventilation by using perforated metal and other devices, all of which failed utterly, through the bees immediately stopping every opening with propolis.

Brace-Combs, Burr-Combs,

or comb-projections and attachments such as are found between frame ends or under the sections, have always been the result of the old-fashioned crowding plan which the majority of bee-keepers still adhere to when working for comb-honey. But once and for all the apiarist should disabuse himself of this prejudice against Simmins' new system. Comb-honey is finished off just as well, or even better, and moreover in larger quantities, where so much space is allowed below the stock, and between all the

rims of the non-contact chambers. And lastly, but not by any means the least desirable feature, is the fact, so strongly pointed out by users of this hive of advanced construction, that everything is cleaner and so much more easily manipulated than is the case with common hives.

With the space below the stock hive proper, never being completely filled or finished off, the bees are not induced to start inconvenient comb attachments at any part of the hive. Thus, in

Starting Sections below the Stock,*

these are not left permanently, but must be moved up—crate, bees, and all—just as they are clustering to make a good start on the foundation.

When manipulating the chambers any super or stock hive may be placed corner-wise on the back door as it lies on the top of the case, forming a convenient table, with the cleats uppermost, and on which the supers may rest without crushing a bee. The cover may be inverted on the ground for a similar purpose.

The Vital Question of Wintering.

My hanging-chamber hive fulfils all the necessary conditions for ensuring successful wintering in the highest degree. That the hive stands pre-eminent in this respect is shown by the fact that the stock chamber proper not only hangs quite clear of the floor, but may be several inches above it. It is then self-evident that the usual refuse and moisture collecting about the junction of the common hive and floor have no place in this hive.

* The Author has at no time advised that sections should be completed below the stock; and critics who have imagined such to have been my teaching have wholly missed the great principle of honey production, and the starting of new combs, for completion *above* the stock.

Every part is always dry and clean, and being thoroughly ventilated, because of such construction, with the

Heavier Foul Air

constantly carried away at the bottom, a colony of bees can maintain in perfection that semi-hibernating condition so essential to their well-being at this critical period of the year. Moreover the combs do not become mouldy, and therefore remain sound for a greater length of time. Consequently one of the

Most Important Features

in connection with this system is the fact that a vast population is brought into existence almost before the bee-keeper realizes the fact in early Spring. Unlike other laborious attempts to secure control of bees, the management of the Conqueror Hive is carried out, especially when controlling swarming, with the least possible disturbance to the normal condition of the constantly progressive colony.

A System

inaugurated by my prize hive at South Kensington, 1878, and perfected in my Conqueror hive introduced in 1888, having stood the test of practical experience, while other ideas and plans based upon no positive system have come and gone, deserves the most serious consideration from all practical bee-keepers, seeing that it is founded upon sound economic, scientific, and natural principles combined.

A Strange Objection

made by many prominent bee-keepers is that there is too much ventilation allowed in this hive. It is indeed very strange that many men should be as much afraid of allowing ventilation in their hives as they are in their own sleeping apartments.

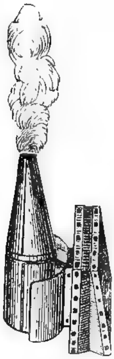


FIG. 19.

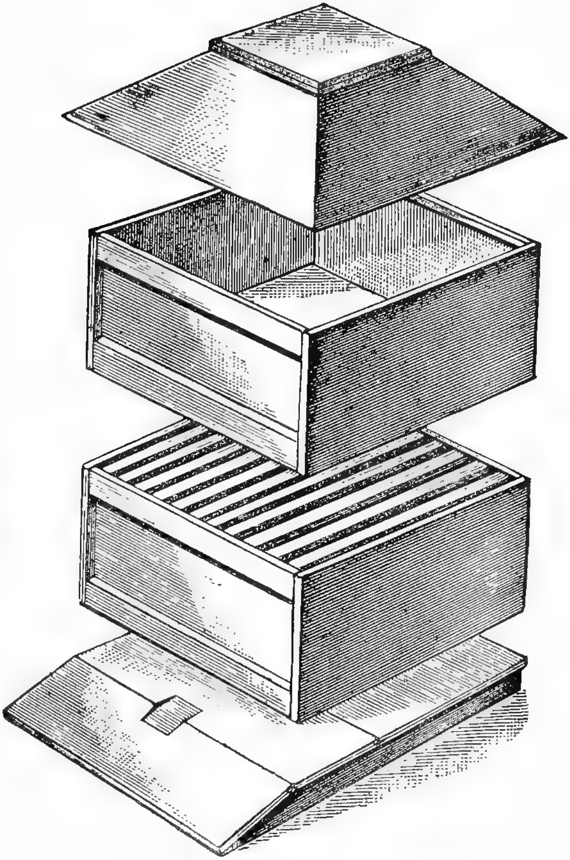


FIG. 20.
Design of "Economic" Hive.

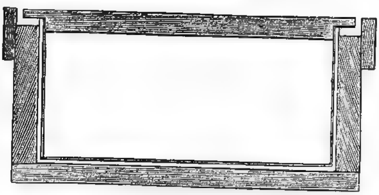


FIG. 21.
Position of Frame resting on zinc runners.

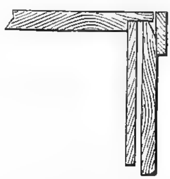


FIG. 22.
Frame end resting on bevelled edge.

It has been shown how the foul damp air is disposed of; consequently bees are warmer in this hive than they are in the old-fashioned close-fitting hives that retain the cold damp air; and it is passing strange that so many teachers do not yet understand the first principles of hive construction and bee-control.

Bee-Paralysis

has been both cured and prevented by the use of this hive and its method of ventilation, without any other aid whatever; but those "authorities" who are frightened by revolutionary, but rational methods, will not allow themselves to believe these statements.

The Complete Success

accorded to this hive and system must be the final proof of a correct construction and management, and the results of 100 lbs. to 200 lbs. of comb honey per hive, even in poor seasons, leave little to be desired by the ardent and persevering apiculturist.

The Conqueror Supers

are all fitted with double walls on two sides, while slatted dividers (fence separators) are placed at *each end* of the rows of sections, with a clear bee-space between them and the walls of the super, thus giving exceptionally free admission to the sections, and at the same time disposing of the old trouble of thin combs in the sections at the ends. Hence the process of comb-building is very rapid, and consequently the brood combs are not crowded to the exclusion of the queen, and the population of the colony is therefore maintained at the highest power.

For the sake of uniformity, the Standard Stock Chamber is also made with double sides; but the Commercial Chamber has single sides. All chambers are then of the

same width, so that the same outer case is used for all, the same supers being worked with either a Standard or Commercial Stock Chamber.

The Removable Back of the Case

is adjusted in the most simple manner possible, the result of many years' practical study. It simply drops into its place without any metal fastening whatever; hence I am occasionally amused by correspondents asking if hooks and eyes or hinges ought not to be used? Certainly not, unless you wish to go backwards over the same experimental ground that I have traversed, before finding the most practical method of securing the back. In addition to the above, the sides are made to "bind" inwards at the back, while the shape of the cover also aids in securing the top more firmly. In opening, the sides are slightly pressed away while at the same time the back is lifted up and outwards.

In Painting

it is quite necessary to give at least two coats of paint along the angle formed at each side by the inner plinths or stays; also up under (inside) the floor rim, and fully one inch up under the lower edge of the cover; otherwise wet is sure to soak up, and ultimately destroy the wood.

A COMMERCIAL STANDARD FRAME.

I must state without hesitation that the Standard frame of the British Beekeepers' Association is much too small for any bee-keeper who is attempting to produce honey on a wholesale scale. It is true I have been using the Association Standard frame largely for some years past, for queen-rearing purposes, and expect to continue to do so as long as I supply bees to those who have adopted that size;

but its use has only the more forcibly brought to my mind the decidedly superior advantages enjoyed when using a frame measuring 16 inches by 10 inches. Reference to the pages of the *British Bee Journal* will show that there were not a few who held out for a brood or stock frame of the above dimensions at the time the Association decided on the too small and shallow stock frame now almost universally used in this country, and conspicuous among the opposition was that veteran bee-master, C. N. Abbott.

It would indeed appear that almost the sole reason why the present Standard was adopted, was because of its near approach to that of the "Woodbury" pattern, a slight alteration being made that it might accommodate six American $4\frac{1}{4}$-inch by $4\frac{1}{4}$-inch sections, and yet in practice scarcely one bee-keeper in 50 has ever brought the stock frame into use for that purpose.

The Langstroth Frame,

used extensively in America, and exported largely to other countries, is also too shallow, and used as the Hoffman, spaced only $1\frac{3}{8}$-inch from centre to centre, is the cause of many winter losses, as the thin shallow frame does not carry sufficient store above the cluster.

Great Security in Wintering.

Evidence in favor of the larger or deeper size, as giving greater security in winter; a larger population more rapidly developed in spring; less inclination to swarm; and at all times a more prosperous and profitable colony, with comparatively little trouble in maintaining that prosperity —has been accumulating right along, as shown by the practical results secured from such colonies as remained in the old frames used by myself and other apiarists, and which should have been, and may yet be recognised as the Standard frame in this country, viz., 16 inches by 10 inches.

It does not denote progress to hold to a certain size of frame simply because that has once been stamped as the Standard of the country.

I have no wish to create confusion, or to induce loss by urging all to at once take up with the larger frame our old friend Abbott and other veterans attempted to have recognised as the British Standard. That frame has most certainly been *proved*, and I therefore recommend it with confidence as being far superior to the present Standard or the shallow Langstroth for the production of honey on a *commercial and profitable* scale.

The Shallow Langstroth Frame.

This frame, adopted so largely in America in the first place, because it was supposed to induce the bees to enter the supers more quickly when only guides were used; has also encouraged users to adopt four sections in a line, instead of three, the latter being more quickly and completely finished.

Another feature that was allowed to rule the shallow depth of both the Langstroth and British Association frames was the width of boards required for the outer walls, the narrower boards being slightly cheaper. Thus the manufacturer, for the sake of initial false economy, offers an article which is a constant and permanent loss to the honey producer.

A deeper, shorter stock frame is more economical for all purposes and in all climates, as numerous reports show that have been received by the Author over a period of many years.

Moreover, where the Langstroth is used, as in many cases it is, as the Hoffman frame, spaced permanently at the narrow gauge of $1\frac{3}{8}$-inch, the store cells above the cluster are so shallow that no powerful colony is safe during a long

spell of cold weather, as the stores are gone almost before the owner is aware of it.

My critics say, "We can space the frames wider before feeding up for winter;" or, "We can leave the stock a double chamber." But 99 times out of 100 this is not done; partly because the owners think the Hoffman close-ends keep the bees warmer; or in the other case that they fear two stories would be colder. In neither case does the objection hold good, and as single stock chambers are the rule for wintering, a deeper frame will be found more economical, and will also give better results in summer. These are facts gleaned from all directions—north, south, east and west.

"How am I to Extract

from these large frames, having a machine that will only take the Standard Frame?" This is a frequent query, but, my dear readers, why should you wish to extract from these larger stock combs? Your present Standard frames may be used for extracting, leaving the Commercial stock frames with their stores intact for winter. There is no economy at any time, but a serious loss *always*, where stores are extracted from the brood nest*; but if any of the combs are heavily stored during the early summer, by all means remove any well sealed, replacing by foundation near the centre. The removed stores should be

A Golden Reserve,

to be returned if required before or after winter; although where bee-paralysis is prevalent it is better to feed medicated syrup for winter stores.

---

* An exception would be where Infectious Paralysis is feared, when natural stores should be replaced by efficiently medicated food for winter.

"How am I to Stock the Commercial Hive?"

is a frequent question. Well, if you wish to stock it to the best advantage, of course you must begin well. You may unite, and at the same time transfer to it, two other stocks from standard frames, thus making a grand working colony at a stroke.

Then again, you may, towards June, select two good colonies standing near together; place the Conqueror hive between them to receive a swarm artificially made from each, and uniting with one queen. The standard hives, from which the swarms are taken will then be moved away, and these again united, with the other queen presiding. Thus my plan of combined swarming and uniting, without increase, will give two rousing colonies for honey production.* The entire contents of two straw skeps may also be made use of in the same way, if these are on hand. There is really no reason whatever for the bee-keeper to use single swarms and stocks when he is assured the same bees will be doubly profitable when united; while if worked singly, little or nothing may be obtained from them.

"If I Adopt Commercial Frames

what am I to do with my Standard combs?" is another query frequently presented. If not transferred to the Commercial frames the Standard combs will always do for extracting, and will be most useful for that purpose, as it is quite unnecessary, and not intended that the Commercial stock frames should be extracted from.

Convincing Facts

relating to the superiority of large frames and large hives

---

* This is one of the best methods to follow in treating bee-paralysis.

were given some years ago by a writer in *Gleanings*, a prominent American bee journal. After stating that he preferred the Quinby frame, which is even larger than my Commercial, while at the same time he had also the smaller Langstroth frame in use, he says: "But as we found again and again, that the smallest crops came from the smallest hives, on the average, and that whenever the crop was short, 27 out of every 30 small hives had to be fed, while the large colonies had generally enough, we transferred all the bees out of these Langstroth hives. . . . For 20 years our large hives have given us better results than our small ones. . . . I have the *Bulletin d'Apiculture* for October, 1894, and I find in it *twelve selections* from letters coming from Switzerland, Belgium, France and Spain, praising the large hives and the "Dadant" hives, showing *by comparison* that they are more profitable than smaller hives."

The late Captain Hetherington, another extensive American bee-keeper, working nearly 1,000 colonies at a time, was also assured that nothing but a large frame would give him a certain income year after year, and the position he attained among honey producers is undoubtedly one of the most convincing arguments I can bring forward.

For Comb Honey.

The Commercial Hive as a single stock, is used with eight frames* and two dummies, 1½-inch thick, either packed or used as dry feeders; the object being to keep as *narrow* a brood nest or cluster as possible, in opposition to the usual plan of adopting a wide supering surface above a shallow chamber. The latter does not give

* The stock should at least be worked up to the full complement of eleven frames, reducing to eight when supering.

sufficient *power* below, neither does it properly economise power for the rapid and perfect production of section honey above it, as does a narrow but more populous cluster among our eight large frames, which arrangement provides for the more economic distribution and conservation of heat.

The principle of a *narrow deep cluster* must be continued throughout the whole tier of sections as well, and hence each crate of sections contains only three rows of seven sections. I have tried varying numbers upon different surfaces and find it a serious error to attempt to crowd many sections upon an extended surface. On one occasion I supered a small stock with crates of sixteen sections only in each set. These were completed rapidly in the most perfect manner, and five sets were more quickly completed than three supers of 21 each in other hives. Our American friends spread too many sections in each crate, more especially in the non-protected hives so generally used.

The section crates are double walled all round, and packed between, giving the most complete protection for the rapid perfecting of the combs of honey. The roof is made in the same manner as that illustrated for the Economic.

SUPER CRATES

to hold from 18 to 21 sections, can be made as follows: Put together a plain box of the size desired with neither top nor bottom, and wide enough to take three $4\frac{1}{4}$-inch sections across besides the thickness of rails supporting them. Such rails are in the form of an inverted ⊤; the sections resting upon the ledges which must not be more than $\frac{1}{4}$-inch thick, giving that space between the sections and top bars of the frames. Any space left at the one end of the sections must be closed by a piece of wood to

act as a dummy. This I prefer to fit only just tight, as both wedges and springs are quite unnecessary. With crates in general use for common hives, the

Space between the sections and top bars

of the frames is objectionable, if it should exceed $\frac{1}{4}$-inch, in that brace-combs are nearly always attached to the under-side of the sections. To avoid this entirely with ordinary hives I adopted, in 1881, a crate with the bottom composed of slats standing $\frac{3}{8}$-inch apart. When in position these slats come close upon the frames, but at *right angles* to them; thus the bees have simply a number of small holes for passages—about $\frac{3}{8}$-inch by $\frac{1}{2}$-inch, which they are compelled to keep open; no brace-combs are built in consequence, as those are always continued from the wax that may be along the sides of the frame bars, when the old plan is allowed. During the many years I used this style of crate I had no brace-combs attached to my sections.

Fig. 27 will give a good idea of the manner in which the said square passages are formed; C being the bottom slats of the crate, and D the frame bars.

But now having the slats close upon the frames it will be readily understood that a full-sized crate could not be used without much inconvenience; I therefore made it in two as seen in Fig. 28, each holding twelve to fifteen sections, and have had no more difficulty in removing one half at a time than in taking out a frame of comb. In replacing them a gentle horizontal motion will cause every bee to run down out of the way, though smoke first used will at once clear the course.

But perhaps the most important point with my twin crate, is that as the central combs are completed, by simply turning the outer row to the centre, the whole are

finished off more evenly and in less time, and thus the usual outside thin sections are a thing of the past.

With this class of crate I have generally used my bee space sections giving their own passage under, but if the one-piece section is used strips ¼-inch thick should be inserted for the lower corners of the sections to rest upon.

In the Conqueror Hive, the space below the stock prevents that overcrowding which induces the building of brace-combs in old-style hives.

SECTIONS.

The one-piece sections wherein the new comb-honey is built are made in several forms, either with a bee space at top and bottom, or such spaces on all sides, or no bee spaces at all.

The widths in general use are—2 inches to be used with separators, or 1¾ inches without.; each 4¼ inches by 4¼ inches, to hold 1 lb. of honey. Sections to hold 2 lbs. are not in demand, but those to contain about ½ lb. may generally be disposed of; these should be 1½ inches through, 4¼ inches deep, and barely 3 inches wide. The deeper and narrow section 5 inches by 4 inches by 1½-inch is now used to a large extent. Thin combs are sealed more quickly, but a total change of furniture is a serious matter to most bee-men.

The 5-inch by 4-inch by 1½-inch section, worked with cleated (plain or fence) separators, weigh exactly 1 lb. Any section thinner than 1½-inch is objectionable and should not be used.

Folding Sections.

By making a block to fit the inside of a section, fastening it horizontally to a table, the operation of folding is carried through at a rapid rate, and one can always be certain of

METHODS OF WIRING FRAMES.

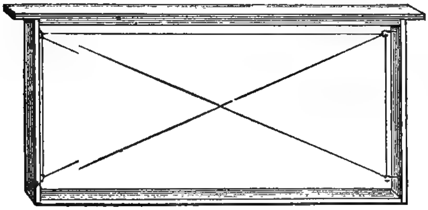


FIG. 22 A.

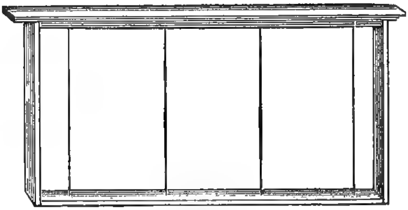


FIG. 22 B.

"The way that is wavy and wrong."

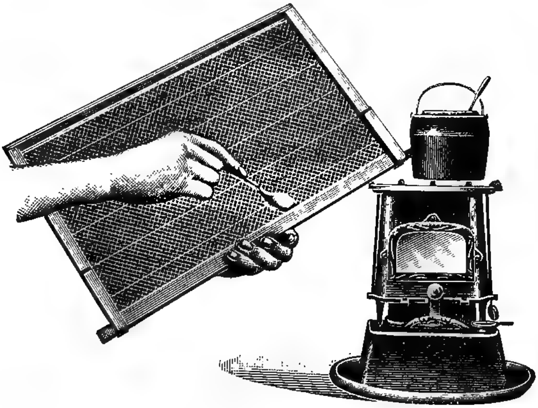


FIG. 22 E.

The most expeditious method of fastening Foundation in Brood Frames.

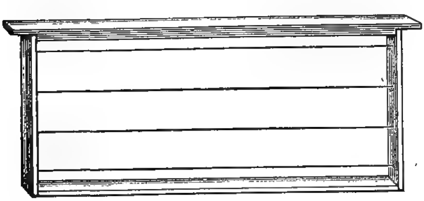


FIG. 22 C (Standard).

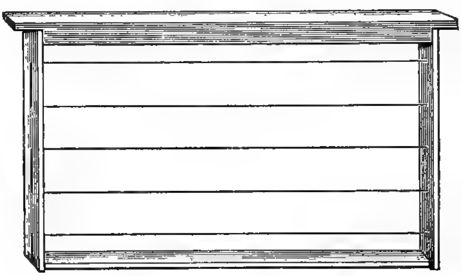


FIG. 22 D (Commercial).

"The way that ensures Combs straight and strong."

them coming true to square. With a lever and cramp motion to take the strain at two opposite corners, the tenons may be locked together as fast as the sections can be laid on the block. In dry weather these sections must first be damped at the V-cuts, or many will break.

The one-piece section has now taken such a hold in general estimation that no other style will ever supersede it; but where the apiarist has the time and convenience to make for his own use, my simple bee-space section will cost him even less than the other.

Simmins' Bee-space Sections.

These were introduced prior to 1880, and the comb-honey in them has been much appreciated wherever offered for sale. Glass was used for the top and bottom rails in the first instance, and the top rail was split to receive foundation (Fig. 85).

The side bars are each $4\frac{1}{4}$ inches long by $1\frac{3}{4}$-inch wide, with a saw-cut across each end, at $\frac{1}{4}$-inch from the edge, into which the top and bottom rails (1-16th inch thick), are fixed securely; these being $1\frac{1}{2}$-inch wide and $4\frac{1}{8}$ inches (bare) long. For $\frac{1}{2}$-lbs. the sides are $4\frac{1}{4}$ inches by $1\frac{1}{2}$-inch, and the thin rails $1\frac{1}{4}$-inch by $2\frac{3}{4}$ inches.

If the sections are required flat, the top and bottom rails must be a little thicker, with a tongue and shoulder as shown by Fig. 86. In that case the saw-cut in the side bars will be half the thickness of the horizontal rails from each edge.

Separators

are made of either thin wood or tin, and are generally arranged to allow a space above or below them of not less than 3-16th inch from the upper and lower part of the sections. One with slots, suggested by "Amateur Expert," who at one time was a contributor to the *British Bee*

Journal, is illustrated (Fig. 87) with slots to correspond with the side bee-spaces in sections. Other separators are the Author's double fence, and the single cleated dividers.

No Metal in Supers.

Woven wire separators, as also those of the new pattern wire excluder are sometimes used, but if one wishes for the heaviest results in comb-honey, he should use none but wood separators.

When sections have no bee-ways they are used with fence or gate separators, having the bee-space fixed by vertical cleats or cross-pieces; which hold the several slats together. The first expense is greater, but the separators are stronger than ordinary wood dividers; and wood is decidedly better than metal in every way.

Simmins' Simplicity or Makeshift Rack

has no bottom rests at all, and allows the sections to stand close upon the frames and upon each other, should occasion require. In carrying, the sections are allowed to bear upon the side strip, and when not in use the racks lie flat and take up little room (Fig. 31).

For years past I have persistently advocated the use of full sheets of foundation in sections, and found no better plan of securing such than by its insertion into my sections cut through on three sides, until in 1888 I designed my latest improvement in the shape of

Completely Divided Sections.

The advantages of these are—(1) the foundation requires no cutting up to fit each separate section, (2) a full sheet of foundation, filling three sections at once, can be put in as quickly and much more securely than inserting a separate piece in a single section, (3) the foundation can be worked

out into comb, prior to the honey season; and without trimming or fitting, or cutting in any way, the same may be inserted immediately and securely into the respective sets of three sections without any special fastening, (4) each set of three sections when in use and filled with comb can be handled in place of single sections, with no possibility of either falling out during manipulation. (See Fig. 39).

The three-side-cut sections ($4\frac{1}{4}$ inches by $4\frac{1}{4}$ inches) can also be used in the divided section frames, and answer equally as well when worked-out comb is not to be secured to start with, the sheet of foundation being placed across the three sections without cutting. This sheet of foundation is not quite the full depth of the frames, so that the usual stretching may be allowed for.

Where 5-inch by 4-inch sections are used with three sides slit, these can be used for starting the foundation (as drawn combs) in the same manner as the wider, but completely halved sections.

The length of the full sheet of foundation (to be placed directly and rapidly across three or more sections at a time), is gauged by trimming with a board made just 1-16th inch shorter than the width of the row of three or four, whether $4\frac{1}{4}$ inches by $4\frac{1}{4}$ inches by 2 inches, or 5 inches by 4 inches by $1\frac{1}{2}$-inch.

No foundation should be purchased without an assurance from the manufacturer that wax from which it is made up has not been procured from any apiary affected with disease.

CHAPTER XIII.

COMB-FOUNDATION.

THE several frames illustrated, showing the foundation in the centre, will convey to the novice some idea as to its use. This artificially made basis of new combs is really pure beeswax, and the sheet is first obtained by dipping nicely planed pine boards into the hot wax*; the plain sheet thus made is afterwards passed between rollers, which are so engraved as to give the wax the exact form and appearance of the natural mid-rib of all comb as the bees make it when left to their own devices, except that the comb foundation made by man gives the base of a more perfect, because more regular, comb than the insects themselves produce. The foundation is gauged to the size of worker cells (five to the inch); therefore, drone cells, and consequently drones, are excluded, while the combs produced are as flat as boards.

Drone foundations may be prepared from dies of that gauge, and these are often used in extracting supers.

According to the thickness of the sheet required, whether for thin super foundation or for use in the stock frames, so many dips have to be made before the wax is peeled from the boards. Of these, two or three sets are required on

---

* Rollers may also be used throughout the process, but this explains the original method.

hand standing in water, to give time for cooling and saturation.

Salt as a Lubricant.

The process is modified where rollers are used, but in either case brine appears to be the best lubricant, and at the same time a disinfectant.

There are a number of machines in use, such as the Given, Van Deusen, and more recently the "Weed" Process. Of these, the Van Deusen gives the most beautifully finished foundation I have seen, but, being flat bottomed, the bees appear to waste much time in converting to the natural base; though it must be acknowledged that in doing so comb is produced that has so thin a septum as to be equal to any all-natural comb. I should consider a perfect super foundation would have nothing whatever but the bare base of the cells.

Foundation in the brood chamber gives a great saving in time under some conditions, as hereafter noted, but there are times when it is an unnecessary expense, more especially when the beekeeper has all the stock he requires, when he will become a producer of wax instead of a consumer of that article.

How to insert Foundation in Frames and Sections.

The original method, and one usually practised by myself and others, is by melted wax run along the sheet of foundation on both sides where it meets the top bar. A board, 7 inches wide and 13 inches long, has screwed on the back two strips of $\frac{3}{4}$-inch stuff, which project about an inch over. The two projections on one side I have arranged as shown (Fig. 88) with a wide-headed screw to each, enabling the gauge to be regulated to a nicety. When set upon the inverted frame it stands $\frac{1}{8}$-inch off from the centre of the bar, thus providing for the

thickness of the foundation that it may hang exactly in the centre.

For Melting Wax,

use a common glue pot, with a small brush or a spoon with its sides bent up to meet, allowing the drip to run down the angle, joining the foundation and frame securely. Remove the gauge-board while reversing and then wax the other side, with the frame always held at a slight incline, starting the wax at one end, and allowing so much that it will just run to the other end. Be careful that the wax is kept at an even temperature, over a small paraffin stove; if too hot it will weaken the sheet, and if too cool, it will not hold the foundation in place.

Other Plans

are such as have the top bar split nearly its whole or entire length to receive the sheet of foundation, when two or three nails or screws are driven through, holding the two halves together with the impressed wax between. There is little economy in so weakening and disfiguring one's furniture permanently simply for this one preliminary operation, while the open cut along the top of the bar is the very best harbour for the wax moth, as the covering over the frames adds still further protection to such crevices.

Abbott's Frame

has an ingenious device on the under side of the top bar. Twin grooves are cut with a thin strip left between. One groove takes the edge of the foundation, and a long wedge is then pressed into the other, holding all secure.

As a matter of fact, I have had no difficulty in getting combs built out perfectly true from foundation simply waxed to the top bars; but the frames *must* be closer

THE COVERED APIARY. [*From a Photo.*

together, so that many bees do not cluster upon any one sheet. Through many apiarists failing at this point, foundation for brood frames has been made much too heavy, being only four or five sheets (standard) to the pound; whereas I have no trouble in working full sheets at eight feet to the pound; indeed, ten feet to the pound have been worked without sagging.

Where Swarms are Hived upon Foundation, the frames should be spaced not more than ¼-inch apart, with very light covering for the first few days, and a wide entrance. The Author has hived swarms on foundation with no covering for a few days beyond the deep roof.

Those who desire extra tough combs and well-filled frames, will find the most satisfactory plan to be that of

Wiring the Frames.

This is often done by piercing holes through the top and bottom of the frames about two inches apart to receive the wires, while another is run from side to side in the shape of the letter **V**. I prefer the parallel wires to run from side to side (Figs. 22 C, 22 D) as the bottom rail is generally too weak to stand the strain, but in this case the sheet of wax must be secured to the top bar.

Horizontal versus Vertical Wires.

Vertical wires are undesirable, not only because there is no "stay" in the bottom bar, but also for the reason that the combs built on them are "wavy," and frequently almost divided by the weight of the bees while the incomplete comb is soft.

Crossed wires and those hooked around the frame are also detrimental, and non-practical, as the bees never build properly over the hooks and crossed wires.

There is no advantage whatever in using hooks, with

wires running close to the frame ends and top bar. Horizontal wires are threaded through holes pierced in the end bars only, and in this way the combs are finished as true and flat as boards. (Figs. 22 A, B, C, D).

The Commercial frame has five parallel wires ; the Standard four wires ; and the shallow extracting frame has three. As a rule, amateurs use an insufficient number of wires.

Fine tinned wire is used, and the starting point and finish should be carefully fastened, the ends being wound round a tack, which is then driven home, holding all securely. See that all the wires are drawn tight ; place the sheet of foundation on your block ; the wired frame upon that, and now press the wires into the mid-rib. Various instruments are used for the purpose, the Woiblet Embedder being the best, but a

Simple Embedder

can be made from a common nail filed up round at the point, with a slight indentation to run over the wire, which can be used at a rapid rate with a convenient handle. If the instrument is used cold the point must be frequently passed over a cloth saturated with oil. I prefer to use the wheel embedder with hot water only, and have used no other plan for many years, always having an assistant to warm the sheets as worked in.

Even new foundation may require warming before the wires are fixed ; and no old foundation should be used without carefully turning before a fire.

Mr. A. I. Root, editor of *Gleanings*, and others in America, have been quite successful in the use of an electrical battery on a simple scale, and they find the process of embedding the wires thereby far more rapid and satisfactory than hitherto.

Sections should be Filled

with new white combs if possible, and never with anything less than full sheets of foundation. The former, when not worked directly into the sections, should be cut to go in tight.

Another plan is that of making a saw-cut on three sides of the one-piece section as already shown, and when folded the foundation is readily inserted in such a manner that the most perfect combs are obtained, while for packing to travel for long journeys, both this and the completely divided section give greater security than is obtained by any other plan.

Simmins' Divided Section and Holder.

The foundation is secured to one half of this section frame, or holder, by using a flat blade which is rapidly pressed along the edge as it lies on the top bar, at intervals of about one inch. The ends are not to be secured. The foundation is either first worked into comb, or the halved sections immediately placed on either side. Three halves lying on a flat surface are first covered with the half-frame having the sheet of foundation, when the blank half with the other portions of the sections is put to them, the foundation lying between. (See Fig. 39).

Inserting Foundation across Several Sections.

Some 25 years since the Author showed how to insert the foundation in three or more sections in a line at one stroke without any other fixing than the cuts in the three sides of each section ; or between a line of completely halved sections. And this is done quicker than when a small sheet has been usually secured in each section separately.

With the three-side-cut sections, whether $4\frac{1}{4}$ inches by $4\frac{1}{4}$ inches, or 5 inches by 4 inches, the illustrations will show

how the three sections are first pushed *nearly* half out by using a suitable block. The three upper halves are then raised with the left hand, when the full length sheet of foundation is at once passed in with the right hand. The frame of several sections is then turned over, and quickly pressed on a flat surface, returning all in place.

The sheet of foundation should be cut to leave about $\frac{1}{4}$-inch between it and the bottom of section; while the length should be trimmed by a gauge to 1-16th inch less than the width of the three sections.

Removing Finished Combs.

The combs when finished are helped out of the frame by the same push block, and the three sections parted with fine wire or a thin blade. Meanwhile the set of three may be handled as one, and it will be seen there is less danger of any section slipping out of the frame, as where separate foundation has been used to fit each section.

Out-of-Date Methods.

Many beekeepers in America and elsewhere still adhere to various tedious plans of inserting foundation into single sections; while in Great Britain and Ireland the majority fill the single section by the split top bar only.

Those who once try the Author's expeditious plan of furnishing the entire row of sections at a stroke never go back to the old slow and less secure devices.

In stocking a bar-frame hive the swarm, or bees that may be transferred, should be induced to complete their combs and fill them with brood as rapidly as possible, by interchanging the outer combs or foundations with those near the centre, one or two at a time, thus securing a solid brood-nest before there is any appreciable loss of the adult bees.

CHAPTER XIV.

HOW TO STOCK THE FRAME HIVE.

THE most simple method is that of inserting a swarm. Good swarms of native bees can generally be bought from a cottager in May for 10s. or 12s. each. They would, in that case, be brought home in a skep towards evening, when they may be shot out upon the frames * spaced as already shown and provided with foundation, when a piece of ticking should be laid over them so as to not quite cover the whole surface of the hive, when all will soon draw below. When they are quiet, arrange the quilt carefully, set on the cover, and leave an entrance at least six inches wide. As the centre combs are built out and filled with eggs, part them and insert one or two of the outside frames of foundation in the centre of the cluster until all are well filled. By this time reduce the entrance to about three inches, unless the weather is quite warm, having previously added warmer material above, such as two or three thicknesses of carpet above the ticking or a tray of chaff or cork dust two inches thick.

* Most of the "Guides" advise that the swarm be turned out on a board slanting up to the entrance, but this is not so satisfactory.

Feed in Unfavorable Weather.

It is very necessary that swarms should be fed if no honey is coming in, so that the foundation may be quickly drawn out as complete combs well filled with brood, thus securing a good supply of young bees before the adults are much reduced in numbers.

Best Time to Transfer.

Where one has straw skeps he will desire to transfer his bees to the frame hive. This can be done in April to great advantage, as it is just then that the stimulation does most good, and excites the bees to extend the brood nest.

The bees are first to be removed from the skep by either of the methods before mentioned (Chap. II.), when the best combs are to be cut to the right size to fit exactly tight into the bar-frame; all edges being cut quite true so that they fit together well, and can be more readily secured by the bees. Tie two or three pieces of ¼-inch tape round the frames to keep all in place, and return the combs to the bees, which may first be shot into the bar-frame hive. They will soon draw among the newly-transferred combs and clean up their house, where, after a day or two, one will hardly tell where the joints were. Close up with division boards, cover up warm, and keep the entrance not more than one inch wide until it is absolutely necessary to make it larger. The patches of brood must be arranged so that the larger are at the centre, and the smaller graduating to either side, thus securing greater protection. Should the bees appear crowded with only the combs transferred, give a frame of foundation in the centre, and another as soon as they begin to cluster on the outside of the division board.

Feed carefully so that there is always a little store in hand, but not enough to hinder the operations of the queen. Continue such stimulation until honey comes in.

It is so frequently recommended that the contents of fixed comb hives should be transferred 21 days after swarming, that I consider it advisable to show that this waste of time is quite unnecessary. The swarm should be hived upon six or seven sheets of foundation close to the parent colony and facing the same way. Within ten days the young queens will be hatching out when a cast or second swarm would issue from the old stock. This appears to have been overlooked; therefore I advise transferring on the seventh day after the issue of the first swarm, first carefully removing one of the queen cells before druming on the hive. While shifting the combs, cut out all the other royal cells, and after the operation return the one previously removed, which meanwhile should have been placed above the first swarm between the quilting to prevent chill. As soon as the young queen hatched therefrom is laying freely, destroy the other and unite the two colonies on the second evening following, when supers may be at once put on.

It is better that transferring operations be carried out in some warm room, or manipulating house, first laying a sheet of paper on the table whereon the tapes are to be arranged, with the frames on those, so that all is in readiness for tying as soon as the combs are fitted. While it is not absolutely necessary that the combs be fitted in just the same way up as they were built, it is not desirable to have them inverted, but to save material it is often advisable to put them in on end, or half inverted, as I have done for many years past. Certainly there is the brood to handle if transferred before the 21 days have expired, but with ordinary care this is not damaged, except where

the knife cuts a straight line, and that is far preferable to having the combs full of honey.

The edges of the combs should be cut evenly, and well matched to fill out the frame, when they will be more quickly repaired by the bees.

Other Plans of Transferring,

such as the following, may commend themselves to either the novice, or those who have little time to spare.

The first is to place the fixed-comb hive upon the frames of the modern hive, with a slatted board between, and allow the bees to work downwards on the combs or foundation placed for them. Towards the end of the season the stock will have its brood located in the frames, while honey will probably occupy the whole of the upper combs. This can then be removed, but the stock must not be allowed to starve, as it is quite likely very little store will be in the brood combs.

The other method is that of placing the skep or other fixed-comb hive in an inverted position immediately *under* the frame-hive, allowing communication through an opening in an improvised floor. In this case the inverted combs will be gradually emptied of everything. The stock will then take up its abode in the frames, and also work in supers above. These empty combs can then be transferred at leisure.

Uniting Two Stocks or Swarms

when furnishing the bar-frame hive will always prove the more satisfactory process in the end; and this fact should never be lost sight of.

When uniting either stocks or swarms it is most desirable that only one queen be left, otherwise there will be some loss of workers as they "ball" the surplus queen, killing each

other while the queen herself may be safe for several hours.

While it is not always desirable that both queens should be removed, the selected queen may be caged at mid-day and liberated in the evening after the union is accomplished.

In my own apiary I use the tubular cage, and after uniting, either push the open end diagonally into the honey, or plug the end lightly with a piece of dandelion leaf. In the former case the bees help the queen out; in the latter the leaf withers and she is out in two or three hours, thus no further attention is required.

The commercial bee-keeper of to-day cannot hope to secure adequate or reliable returns from a single stock chamber of small frames. He requires the equivalent of three Standard ten-frame stock chambers ; two eleven-frame Langstroth chambers ; or two ten-frame Commercial (16 in. by 10 in.) chambers, full of brood before the honey-flow commences.

CHAPTER XV.

GENERAL MANAGEMENT.

RELIABLE queens and workers, large frames, large hives, and enormous colonies can alone ensure surplus honey in paying quantities.

Nearly everything depends upon proper treatment in the

Autumn ;

hence I begin with the management for this period, and if the apiarist keeps only young queens he will have no need to stimulate the hive for the production of young bees at this time ; while the *only reliable stimulation* for early Spring breeding is secured by correct Autumn preparation.

Feed " Solid " in September.

I think most of us put off this feeding business as long as possible, and not always is it from idleness, but in many cases doubtless with the hope that some favorable spell of honey weather will bless us by helping the bees to fill up their combs naturally.

Mr. Abbott, the founder of the *British Bee Journal*, considered that feeding should be carried out slowly throughout August. This certainly is wise advice to follow

where no honey is gathered, but when that month is allowed to "slide" by, or when the heather is relied upon and fails, then I say "Feed Solid" in September, and not later than the middle of that month, if possible.

Rapid Feeding the only Safe Way.

In Autumn rapid feeding does what? It ensures a high temperature, and a high temperature ensures *sealing* of the combs so stored; then a dry atmosphere within the hive, no matter how cold it may be during the Winter.

Protracted Slow Feeding means Waste;

waste of energy, waste of life, and of time; useless and expensive brood-rearing late into the Autumn. Waste of time the following Spring, as such overworked stocks will not start early brood-rearing.

Slow feeding does not stimulate the bees to that extent which causes them to "roar" in expelling the excess of moisture, hence a large portion of the stores remains uncapped, resulting in a cold moist atmosphere; a serious, very serious detriment in Winter.

Young bees produced too late in Autumn do not winter well, and die off rapidly; while the hardy adult bees become prematurely aged in the process of rearing them.

Feeding should all be finished in September. Bees hatched in early August should live until April and May of the following year, provided they are not disturbed by feeding candy, and are of the right strain.

Feeding 100 Colonies in a Week

is not at all an impossible undertaking where one has suitable frame feeders, which hold twelve or fifteen pounds each. A strong colony will empty such a feeder in less than 24 hours, with little waste of energy. Consequently

the whole Winter's supply may not only be stored, but most of it will be sealed up in little more than a week.

From that time, without any further attention, breeding will steadily go on, until most of the uncapped stores will be used up, and finally, sufficient empty cells will be found just where the bees decide to cluster, in the usual compact mass.

Leave all the Combs

for the bees to winter on, with a passage communicating over all frames, otherwise insufficient stores may be allowed, and the bees at once realizing the situation, will not expand the brood nest rapidly in Spring; or they may even die out before the owner has a chance to add more food.

Unite Stocks of doubtful Strength.

As mentioned elsewhere, all weak colonies must be united before feeding takes place; and not simply weak lots, but others about which there is the slightest doubt as to them coming through all right. The reader will ask: "How are those others constituted about which there can be any doubt, other than really weak stocks?" In the first place I should say those which have old, or otherwise unsatisfactory queens; those which through any oversight may have been without a laying queen for a few weeks during the latter part of the summer; as well as those which may be short of stores. It will be found impossible to alternate the combs with ten or eleven-frame hives where they are populous, and in that case place the whole hive upon another near to it; or if a little too far apart, bring each hive half-way; and in all cases of uniting, place a wide board from the ground to the flight board, not only to attract the flying bees, but also that both lots may be aware of a strange location, and so have no inclination to fight. (Refer to Uniting.)

What is a Strong Stock?

will be a frequent question. Can I explain the situation fully? I will endeavour to do so for the benefit of the many who never seem to realize that "Unity is strength," and that nothing less than the most intense power, as exhibited in the almost hurricane strength of profitable colonies, will ever bring them a reliable income year after year.

You want for the production of honey just that strength of numbers which turns the ordinary gentle workers into ever suspicious defenders of their home, ready to assail, if need be, any intruder who disturbs them without due precautions! You want during the summer that teeming hive which all day long shows you such a continual stream going and coming, that the tiny insects appear almost thicker than hailstones! You want, after the removal of the surplus receptacles, a hive of ten or twelve frames so overcrowded that great lumps of clustering bees hang outside until really cold nights compel them to crowd inside! This, of course, will not be so noticeable in the Conqueror hive, with its chamber under the stock and the well ventilated space around.

Do you want honey? Honey by the hundredweight and by the ton? Then again read, and re-read the commencement of this chapter, and let the Autumn not pass without a general renovation and uniting of poor colonies. Pray do not cling to those miserable weaklings, fearing you are sacrificing all hope of future *increase.* Ah! that is just the word; in the completion of that last sentence is found the whole trouble. How many there are who cannot bring themselves to "close down" their scattered forces, and so make their chances of wintering almost certain, and positively securing stocks

which will give six times the increase (if required) that any three weakly lots would, even supposing the latter will all winter safely.

So far as food and strength are concerned, we are now ready for

WINTER,

and the next thing to be considered is whether or not more warmth, in the shape of packing, is required. The late Mr. Raitt, a Scottish bee-keeper, once said that the best packing for bees in the Winter is "bees," and I quite agree with him; in fact, I use little more about my hives than they have had in Summer, and at all times consider that the most vital point is the top of the hive, where they are always covered with warm material, such as chaff, or cork-packed trays, pieces of carpet, or sacking.

It is not important whether there are chaff-packed dummies on the outsides of the winter nest, or not; though of the two I give the preference to

Tough Old Combs.

A correspondent once wrote to me saying that in accordance with the advice given him, he was renewing his stock combs about each other year. Such teaching is amazing; and such practice nothing short of suicidal. Why, the poor man was throwing away with his left hand what his right hand gave him. Show me a colony wintering on tough, dark, well-matured combs, and I will show you a colony which is coming out well, if only it has fair average treatment. That stock is so well protected by those sound warm combs, that the bees consume less food in maintaining the necessary animal heat; they need little other protection as a matter of fact; they will breed early and constantly; indeed, you can hardly open the hive at any time from Autumn to

Spring without finding breeding going on to some extent; consequently sound old combs must be looked upon as a mine of wealth, which only the most reckless bee-keeper would think of destroying.

Here is another Picture.

Just look at the stock on nearly new combs, and the totally different state they present. They may be the stronger lot in Autumn; but now watch how rapidly their stores disappear, there is little or no breeding through the cool season, and in Spring no great energy is displayed in that direction until the other hive is almost ready to swarm, and yet the latter still has the larger reserve of stores. Can any sane man question which is going to be the more profitable colony?

Large Combs.

There is another very important matter to be re-considered where honey-production as a profitable pursuit on a commercial scale is to be carried out. No bee-keeper dare neglect the advantages offered by large combs in the stock chamber if he is looking for a reliable source of revenue year after year. This desirable consummation of many a bee-keeper's hopes has time after time been utterly unattainable, because of the simple fact that the hive and frames used, more often than his own management, have been quite unsuited to the object in view. The larger comb-surface of the Commercial frame affords

Greater Security in Winter,

from the fact that the combs are better filled because of the more prosperous condition of the colony at all times, while a larger stored surface is within reach of the winter cluster, and early Spring breeding is more regular.

Winter Passages

enable the bees to cluster above the frames, forming a connecting link with the small outer seams, which are then less attenuated; while the distant stores may be more readily appropriated. Half-inch sticks may be placed across the frames, or as preferred by the Author, shallow V-shaped tunnels of thin wood.

Yet another Point

of the greatest value, is the kind of stock the apiarist keeps. A colony of bees that winter well, will usually do well all the time. Consequently these should be bred from as far as possible for securing queens to preside over all hives in the apiary. Whether they be hybrids, or some special strain of any pure variety bred up to a high standard of excellence, no pains should be spared in perpetuating these good qualities.

Position of Frames.

All single walled hives should stand so that the frames are "end on" to the south wall, that every seam of bees is warmed up during each gleam of winter sunshine, enabling them to change their position and take food, while bringing stores nearer the cluster. Bees will winter all right if so situated and in good heart, but where placed behind thick packed walls they are subject to a continued low temperature, as the mid-winter sun does not penetrate to the cluster. There is no warmth in such double walls at this time, just when it is most required, though of course I admit that they are a benefit as soon as the cluster expands, retaining the heat given out by the bees; but this does not compensate for the greater disadvantage in mid-winter as before mentioned.

Mr. Abbott, when editor of the *British Bee Journal*, was

quite aware of the immense advantage of admitting the sun's rays during Winter, and recommended that a piece of glass be let into the outer wall of double-sided hives. However, double-packed walls to stock hives seldom pay for the extra expense, and besides being more cumbersome, are a positive nuisance during the heat of Summer, when shade is required as offered in the Conqueror Hive, rather than additional heat. For as a matter of fact packed walls cannot be cool in Summer, as the advocates of the same would have us believe. Why the more frequent swarming complained of with these? and are we not told that more warmth is given in Winter? how much more then, *in excess*, in Summer!

Packed Walls to Supers

must be considered a very different thing, and just here is where the heat is needed, not only to attract the bees to start comb-building, but to keep them constantly producing wax, even during cool nights. The rule is to provide flimsy walls to the super crates or none at all in most cases where racks only are adopted. Here is a strange contradiction in the practice of the majority; and yet it is well known that heat—the constant reservation of heat—will always bring the best work in the supers.

Frames in the Conqueror Hives.

As the Conqueror chambers hang clear of the floor, the position of the frames is immaterial, the hive having a deep entrance giving very free access to light and air.

The outer case is protective, and with each gleam of sunshine the whole interior of the hive is warmed up as one finds a greenhouse, hence as a matter of economy in construction of the single Conqueror the frames are placed across the entrance. In the double hive they are at right angles to the entrance.

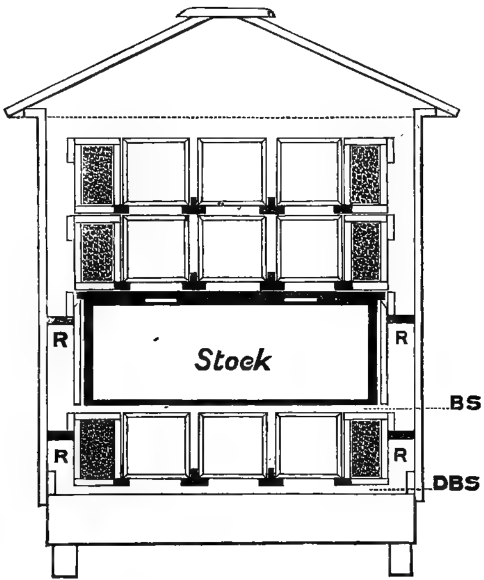
One thing of the utmost importance to which I have often had occasion to call attention, is the

Space below the Frames.

The regulation distance of $\frac{3}{8}$-inch is certainly allowed between the bottom rail of the frame and the floor of the hive when first made, but this is not enough, as the exposure causes the side walls to shrink fully $\frac{1}{4}$-inch. This makes it quite inconvenient and disagreeable in replacing frames, as well as where hives are tiered up; and though $\frac{5}{8}$-inch clear may not work quite well between upper storeys at first, it will soon come right by shrinkage when anything like 9-inch stuff is used, though it may be considered that the wood has been already well seasoned. Now the $\frac{3}{8}$-inch space is not sufficient for winter, and where a lower rim cannot be added to the hive, a circular hole should be cut in the centre of the floor board, about 2 inches in diameter, which will greatly assist ventilation, while providing the inmates with a ready means of disposing of their refuse, dead bees, etc. Failing either of the foregoing, the frames can be raised by placing $\frac{3}{4}$-inch strips under the projecting ears. My pamphlet of 1886 on Prevention of Swarming, explained how the non-swarming chamber was left all the winter under the stock with good results, but it is only within the last few years that the advantage of a deep space under the stock frames has been realized by the majority of bee-keepers.

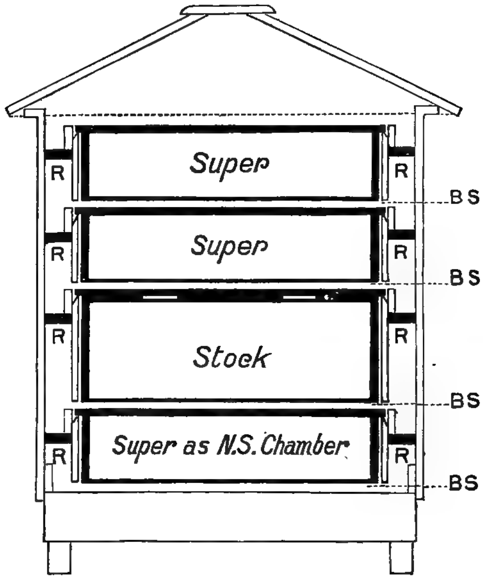
Dysentery and other ills are brought on by the too common neglect of this matter, dead bees drop to the floor and clog the shallow space under the frames, then getting into a mass ventilation is impeded, and when a fine day does occur the bees have enough to do to find the entrance, while the dead and rubbish remain untouched, only to be added to during the next cold spell. Insufficient

Fig. 23. Class A.



This sectional view shows the upper crates close, but either will work under the stock as in Class C.

Fig. 24. Class B.



Sectional view of Hive for extracting. May also be used with three Standard Stock Chambers.

Simmins' Great Principle in Hive Construction, Successful Wintering, and Prevention of Disease.

ventilation and foul matter now begin to tell upon the constitution of the population, and there is little chance that the stock will ever be of much use unless it has immediate attention, as many of the bees are now unable to fly when warm days do offer them a chance; particularly is this the case where the frames run across the entrance with double walls. With single walls and the frames end on to the entrance the bees are not so liable to be blocked in.

Dysentery

may also result from the winter food being too thick and candied, while the bees are unable to search for water; or the stores may be too thin and watery, therefore sour and unfit for the bees. Thus in either case the result is semi-starvation—a case of deficient nourishment with a derangement of the digestive system, and ultimate inability to hibernate perfectly.

Bees that stand entirely in the shade all Winter may finally succumb to dysentery from the simple fact that they have been unable to take a cleansing flight.

Warm syrup applied by inverting a bottle directly on the frames, and immediately over the cluster, will help the bees to recover, more especially if it can be given during a warm gleam of sunshine. The mouth of the bottle should be covered with a double thickness of cheese cloth or old thin linen, so that all can be entirely taken while it remains warm.

Covering above Frames.

Much uncertainty exists among novices as to whether the frames should be covered with porous or non-porous material; but, dear reader, it is just this: if you use porous material above your winter cluster, an entrance not more than three inches in width should be allowed;

if a non-porous covering such as American oilcloth be used next above the frames (of course with warm material above that), then a wider entrance must be provided according to the strength of the colony.

Wintering with no Quilts

above the frames may be supposed by my readers to be something unheard of, and yet some of my best stocks have been wintered in that manner, with a 6-inch entrance. The bees, of course, had tough combs to cluster in, and by the Spring were breeding merrily; in fact, they had larger patches of brood than some others covered up snugly. The large entrance no doubt caused immediate activity when any sunny spell occurred, while those stocks behind double walls, or having smaller entrances, were not so readily aroused to make the most of their opportunities.

Small Entrances Detrimental.

I had two other hives in a bee house with very large entrances facing a constant westerly wind. Upon examination in Spring, these showed three and five combs respectively occupied by brood. The entrance was then considerably reduced when the bees began to contract the extent of the brood nests. Evidently a free opening to the outer air is an item of the first necessity, checking any undue inclination to fly, while at the same time allowing rapid flight when the temperature is suitable.*

While small entrances appear to be detrimental, even in cool weather, with the close-fitting hives, the case is largely modified in respect of the Author's hanging chamber hive,

---

* It is usual to allow small entrances to nuclei, more especially in Autumn, when robbing is prevalent.

which has its stock chamber raised from the floor, and is allowed free ventilation within the outer case.

The position I have taken up in regard to

Plenty of Air both in Summer and Winter

in connection with large hives and frames, is confirmed in a very decided manner by an experience related by Mr. Chas. Dadant, in the *American Bee Journal* of December 26th, 1895. This champion of large hives, and the largest frame in use (the Quinby), states that a bee-keeper he once visited "had five or six hives in a covered apiary facing south. Those hives were placed upon strips made of 1-inch timber, two inches wide, and nailed edgewise on stakes driven into the ground, so as to form a sort of rack. The hives had no bottom boards, for our friend thought that bees succeeded best when they had plenty of air. . . . Strange to say, colonies in these hives wintered successfully, and we were very much astonished, in one of the hardest winters, to find that he had not lost a single colony, while our losses had been heavy."

There is nothing at all strange about the bees doing well with no floor boards. For many years past I have been trying to get bee-keepers to adopt an empty chamber under the actual stock, both Summer and Winter. The reports that come in show conclusively that the deep space under the stock is the only means of keeping the hive cool in Summer, and thoroughly dry all Winter without the least draught through the cluster, which actually hangs in a dense mass below the combs during the severest weather. Thus

A perfect Winter Arrangement

of the combs is secured in the manner already shown with reference to the description of the Conqueror hive, which

with its 6 to 10 inches below the stock hive offers every possible advantage in respect of disposing of the whole of the calamities previously mentioned as to bad ventilation.

Where bees are wintered on Standard frames in long hives, whether the brood nest is placed at the back or front of the hive, the dummy next the open space must stand *clear of the side walls*, just as the frame does. Those who have followed the advice sometimes given, to the effect that such dummy must be tight fitting and have an entrance of only two inches or less cut out of the bottom edge, will have reason to appreciate the loose fitting board.

When keeping bees in a loft, Mr. Cowan raised the crown board of his hives with small pieces of wood, such as match ends, as well as giving the same space between the floor and body of the hive. Perfect ventilation was in this manner secured without draught, being in a large closed space; but the same plan could not be thought of with hives standing in the open.

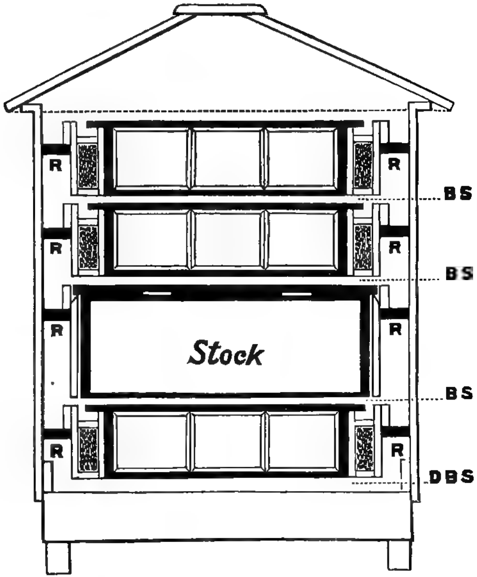
Hives such as the W.B.C., with the stock chamber within a loose outer case, may have a shallow (empty) chamber under the stock hive; as also should those hives that are wintered in the cellar. In the latter case this additional rim should have the sides freely ventilated. If this ventilated rim is not used then the floors are left off and the hives, like bricks, resting on each other's edges.

Really there is nothing to be done to the bees during the winter months, and all the foregoing provisions have to be settled before the cold weather arrives. Cold, with judicious ventilation, and clear space under the frames, a good cover, plenty of stores, and stocks in good heart, can do no harm.

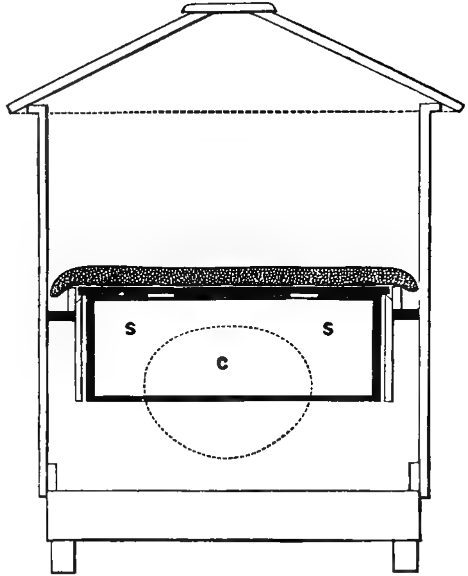
Excessive Packing is Useless;

and may even be detrimental in Winter as well as in

FIG. 25. CLASS C. FIG. 26.



DBS —Double Bee Space. BS.—Bee Space.
R.—Runners.



S S.—Stores.
C.—Position of Cluster in Winter.

SIMMINS' GREAT PRINCIPLE IN HIVE CONSTRUCTION, SUCCESSFUL WINTERING, AND PREVENTION OF DISEASE.

Summer. There is no warmth in extra packing during cold weather; none in double walls or added dummies, though they may be packed with chaff, until at the approach of Spring the bees expand their cluster under the influence of brood rearing, and the higher temperature induced by the greater consumption of nitrogenous food. It is then only that the walls or coverings are warm, or retain the warmth generated by the bees then clustering upon them.

The Winter Cluster

will generally be seen located towards one or other of the outside walls at the ends of the frames, and starting from near the floor at the commencement of cold weather will be found to slowly advance upwards as the stores are consumed close at hand. The illustration, as represented in Figs. 26, 75—78, will show that the cluster is formed upon the empty cells wherefrom the later batches of brood were hatched, and it is at once evident the larger frame shows decided advantages in that an abundance of food is present on each frame occupied by the bees, thus ensuring that restfulness so necessary to the well-being of our little friends, and avoiding the too frequent occurrence of starvation while the distant (smaller) frames may be well stored.

The situation of the cluster is represented by the letter **C**; the stores by **S.**

It should not be forgotten that before the "quilt" or frame covering came into use, most hives were constructed with a bee-space between the frame bars and the crown-board. When the close-fitting quilt was adopted this space was closed, to the detriment of the bees, in that the cluster could no longer communicate at the spot most favorable for the purpose; consequently the outer seams of bees frequently perished.

This calamity can be avoided by placing one or two ½-inch strips of wood across the frames, under the quilt.

Compact Winter Nest.

It may be considered that during cold weather the combs are really *unnecessary* except as the store cupboards. Under normal conditions, during late autumn, at the central lower portion of the combs the cells are all empty, just as vacated by the later batches of brood. As the cold weather comes on the bees form upon that portion of the combs, the nearest possible approach to a perfectly unbroken cluster. Some of them occupy the empty cells and rest head to head on opposite sides of the centre wall of the combs, while others crowd between.

Thus they make the best of the situation as they find it; but careful experiments, conducted over a series of years, have always shown me that the bees prefer to cluster in Winter where there are no combs at all to intersect them, and in this situation have less difficulty in maintaining that animal heat so necessary for the preservation of life.

We can therefore meet them half-way as it were, and while not removing the stores can alternate heavy combs with empty frames, thus bringing the cluster into a more compact mass, and entirely avoiding the frequent destruction of the unfortunate outer seam of bees.

More Bees—Less Food.

The more compact the cluster, the more warmth is maintained at less cost in consumption of stores. A strong colony will consume less food comparatively than a weak lot, which is compelled to use a larger quantity in maintaining the necessary warmth.

Hence we see the want of economy in wintering weak stocks; as also in dividing the cluster of strong colonies by such frames as are spaced only 1⅜-inch from centre to

centre, a very dangerous plan in cold latitudes, as these also carry insufficient stores.*

Hibernating as applied to Bees.†

Do bees hibernate? certainly they do. Perhaps not in the same way that we are accustomed to view the torpid state of the dormouse, the squirrel, or that more voracious animal the bear. While the little brown fellows lay up a store to which they may repair at periodical awakenings, the flesh-eating monster stuffs to repletion and piles up layers of fat on his bones till his shaggy coat will hold no more. He seeks a retreat with the drowsiness of gluttony already perhaps creeping upon him; and then whether dead or alive for weeks he knows not, until it may be fitful dreams preceding a final awakening, cause him to realise that his bones are nearly bare, and his once sleek and tightened coat now folds loosely over his ungainly carcase, the result of Nature's long-continued, if niggardly draughts upon the stored fuel, that just a bare flame of life may be maintained during his dormant state.

How like all this is to the conditions governing the hive bees! These have their period of preparation; their term of low vitality; their occasional break in the monotony of rest; and finally a glorious awakening to all the beauteous gifts of light and life. The only thing different being that whereas the quadruped sleeps—a sleep almost like unto death, the insect may be said simply to "rest"; and in that she is thus free from labour and from any

* The losses in America during the severe Winter of 1911-12 amounted to 75 per cent., through the owners relying on the shallow Langstroth frame, so spaced.

† It should be observed that quite young bees cannot hibernate; and where the stock has been injudiciously stimulated late into the Autumn, there are more of these "soft" bees die off than there are of the adults.

exciting cause whatever, there is then no need for an undue exertion of the digestive organs; food is partaken of less frequently, and the numerous members of the winter nest, but more especially those farthest from the centre of the cluster, are very slow to awake to a consciousness of any change in their surroundings.

It may almost be said that the bees take turns in hibernating, those cooling on the margins changing to the interior of the nest, while the centre of the throng, like the pulsating heart of a single being, maintains a blood-heat temperature, without which the marginal units would soon become extinct.

Hibernating is the Essence of Economy;

economy in food—economy in vital force and energy—a saving of life to the bees and of money to the owner, at a time when flights abroad would mean instant death to the individual members of the community, which only exists as a whole, through the combined heat of the clustering, compact mass of units.

Excitement

on the other hand—even the simple excitement of muscular action—means the consumption of stores beyond normal requirements; and consumption means a corresponding waste of energy, which in Autumn and Winter should be avoided as far as possible, because at that period there is no compensation—no profit to balance the waste.

The Winter Season.

On some cold morning just take a peep under the quilt at the bees of your strongest stock. Be as quiet as you can, dare hardly to breathe, and jar nothing near the hive. Well if you have not made such an examination at any other period of cold, you will be almost startled into

wondering where your bees have gone to. What a mere handful compared with the rousing populous colony you knew to be there when you left them snug and well stored for Winter! It seems hardly possible such a vast host can so contract themselves that a gallon measure will more than hold a population you imagined would fill at least half-a-bushel.

The bee nest at this season is practically its own life preserver, and what heat there is present is only to be found towards the centre of this compact mass of bees. The hive itself acts as a shelter, preserving them from the direct influence of the cold winds and wet, while the temperature around the walls (inside) of the hive is but a few degrees higher than that on the outside. The only change that takes place, and that a highly beneficial one, is when during a spell of sunshine the interior of a thin walled hive rapidly rises in temperature; the bees, quickly responding to this genial warmth, immediately expand their cluster, while many set about bringing the distant honey to be restored in the cells adjoining their winter nest. This is done in such a systematic manner that the extreme outer combs are first relieved of their contents, while the whole outer face is cleared before the other, nearer, side is touched.

It has been declared that the temperature on the inside of the hive walls stands at 80° to 90° during Winter. There was never a greater mistake; as we have already seen it cannot possibly be much higher than the outside air, and such a high temperature is only to be found at the centre of the cluster. Bees not only chill to death, when in small numbers near any wall where the mass of the bees do not cluster, but cannot maintain life if separated by only a single comb from the actual bee nest. A high temperature can only be registered after the bees

have been disturbed, or by withdrawing a previously arranged thermometer from the heart of the cluster.

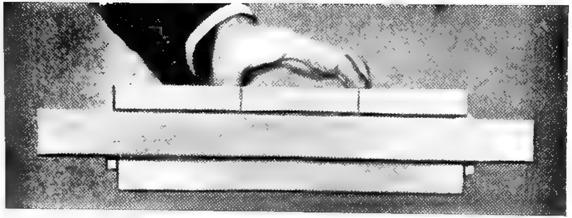
Disturbing Influences.

The act of breeding which re-commences in normal colonies about mid-winter at the centre of the cluster, is not in itself a disturbing influence, for as yet its extent is never developed beyond the means at hand for its moderate continuance. But when the owner begins unduly to feed candy, and meal added thereto, then the elements of additional unnecessary excitement are immediately apparent in a large death rate caused by the premature flight of the workers in search of large quantities of water. The cluster expands unnaturally and thereafter a serious drain is made upon the vitality of the bees in keeping up a higher temperature generally.

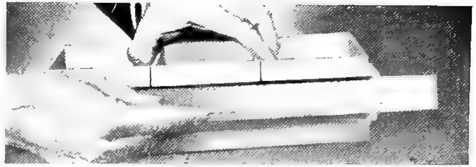
It is far more profitable to leave natural conditions undisturbed until Spring fairly opens, when the first balmy day which permits of a large ingathering of natural pollen will see the last of the hibernating cluster, and then judicious feeding will carry forward a rapidly advancing condition of progress.

Queenlessness.

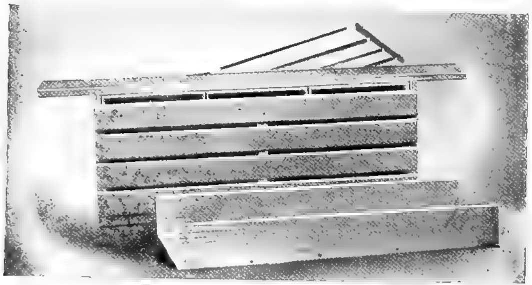
A colony losing its queen before or during Winter, will seldom hibernate perfectly, unless they are fortunate enough to have a small patch of eggs left by her from which they raise another, though of course a useless queen. The only drawback then is the loss of time before another queen can be supplied to recuperate the population. Where there is no possibility of rearing a substitute, the bees though overcoming the first stage of extreme excitement, cannot rest naturally, and the consequence is the stores are rapidly consumed, and even if dysentery does not intervene the bees are scarcely worth uniting to another



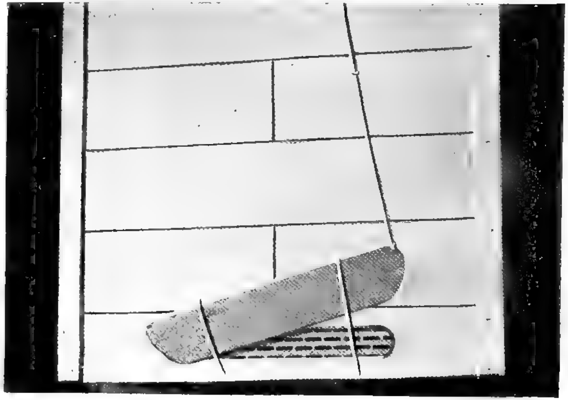
(1) Raising the three halves of the 3-side-cut sections.



(2) Inserting the full sheet of foundation across all three sections.



(3) The Section Block (pusher) and the Double Slatted Divider, showing how inter-communication is allowed in 2-in. sections; or $1\frac{3}{4}$in., 5in. by 4in.



(4) The Dividing Panel or middle fixture in Double and Treble Hanging-Chamber Hives.

stock by the time suitable weather for such operations arrives. I frequently leave late virgin queens with stocks when failing to mate in Autumn, and unite during the following February or March to some other hive with a fertile queen, the stock hibernating perfectly meanwhile.

Insufficient Stores.

This really unnecessary condition is unfortunately too frequently allowed ; and is a serious impediment to successful hibernating. The bees fully realize their beggarly condition, and during the coldest weather may often be heard mournfully roaring while other more fortunate stocks are perfectly quiet. Candy, as I have always pointed out, if supplied, is only a further evil, but the addition of good sealed stores, inserted in the centre of the cluster, or placed flat on the frames, in an emergency, will always bring about the necessary restful condition once more.

When inserting stored combs at this season, these should not be solid with food if dividing the cluster, and moreover, an opening of ½-inch diameter should be cut through the comb near the centre.

SPRING.

About the 21st December the queens will begin to deposit eggs; in due time the young will hatch out, and slowly the brood nest is enlarged, until by the time the older bees begin foraging, the consequent heavy losses are fully compensated by those brought to life while outside all appeared quiet.

The production of young bees at this early date is not always without intermission; cold in itself never hinders it, as the brood is at the very heart of the cluster, but if unable to obtain water for many days together brood

Q

rearing ceases, only to be renewed as soon as the workers can get abroad. Pollen is as a rule always present in well-stored stock combs, and when this comes in freely (March to April), all fresh from the fields, the brood nest is rapidly extended. Now is the time to see that the bees have more than sufficient food to keep them going. With a good queen it can hardly happen that the combs will be too heavily charged with honey at this season, but by taking the outside combs, one at a time, and inserting them in the centre of the brood nest after the cappings are first bruised, great progress will be made. One such comb as yet at an interval of seven or ten days, as needed, will keep the bees and queen busy, and by May 1st, the whole ten or more combs should be one mass of brood, and the hive so crowded with bees that another set of combs will be required *below* the stock hive. If one has no combs on hand, then use sheets of foundation, alternating them with the combs of brood throughout both storeys, and see that the older brood goes below, with the pollen combs near the outside. In any case feed carefully, until honey comes in freely, as such a large population is liable to be rendered perfectly useless by the loss of the brood, by the slightest neglect at this time.

Avoid all Candy

if possible, until April or May, when the hives becoming crowded with young bees, it will be quite safe, and will act as a powerful stimulant both towards comb-building and the rapid extension of the brood nest.

If syrup must be used, give a pint or two rapidly at first, then feed slowly from a half to one pint daily, according to the strength of the stock.

The apiarist should on no account *commence* feeding with combs just filled with dripping syrup. This, and too early

candy feeding, will destroy the original members of the colony by excessive excitement, long before a new population can be reared to take their place.

This is quite a different thing to feeding slowly with thin warm syrup from the end of February if mild, as the bees often suffer much from the want of water early in the year, especially if they have thick or candied stores ; yes, and if they have thin soured stores.

Until Warm Weather

and a mass of new pollen are in evidence, allow stocks to rest ; then, where you have good queens, they will soon bring the stocks up to a prosperous and profitable condition. This must not be considered as a statement that stocks are not to be examined. On the contrary, if a warm spell occurs from mid-February onwards, it is absolutely necessary that the stores be re-arranged, or full combs of stores given where any are deficient.

Nevertheless, the bee-keeper should be careful not to divide the cluster too early with solid combs of stores.

All fair weather in early Spring is not necessary for securing the best results. Certainly frost and snow after the opening of spring-like weather are not to be preferred, but a constant period of fine and mild days will the sooner wear out the older bees ; while the dull days are a cause of rest and recuperation, if other conditions internally are correct for continued progress.

One often hears of bee-keepers regreting that a sudden cold snap has checked brood development and caused a lot of chilled brood to be thrown out of the hives, and yet, after once developing a brood nest, a stock properly adjusted and fed will take no notice of sudden frost or snow, and will continue its progressive state in spite of the elements.

As a result of imperfect wintering a great many bee-keepers are troubled with

Spring Dwindling,*

so called, because after making exertions to develop the brood nest, the bees rapidly decrease in numbers instead of continuing a progressive state of increase. This is almost entirely due to the owner's own mismanagement, or miscalculations. Where it is not directly traceable to disease,

The Causes of Dwindling

may be the retention of old queens ; bad ventilation and consequent dampness in winter ; insufficient food causing a feeling of poverty ; yes, and even an excess of food where no effort is made at the right time to convert it into life and force.

Feeding during Winter, and more particularly with candy, between October and February, inclusive ; as well as stimulating the bees to breed too late in Autumn, or too early in Spring, should all be avoided where one hopes to push forward with the greatest rapidity when warmer weather is approaching.

The Golden Rule

in stimulative feeding must never be lost sight of ; it is this :—" Do not commence until all conditions are favorably combined for the rapid development of the brood nest, from the first moment you decide to break up the semi-hibernating condition of the winter cluster." See " Plumping " ; also " Feeding and Feeders."

---

* Ordinary Spring dwindling is an accident, and not a disease ; but the presence of disease germs will of course aggravate the trouble, or may be the sole cause of dwindling at any season.

SUPERS FOR GLASS RAIL SECTIONS, AND OTHERS USED OVER ORDINARY HIVES.

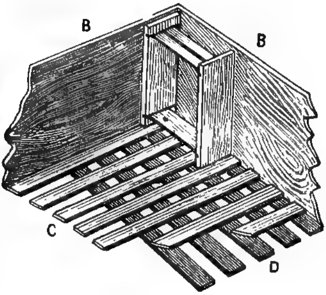


FIG. 27.
Position of Slatted Crate, resting on Frames.

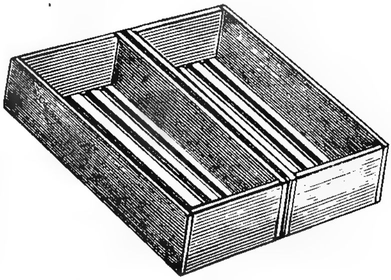


FIG. 28.
Twin Slatted Crate.

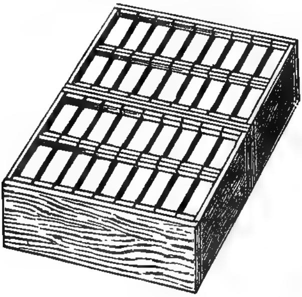


FIG. 29.
Simmins' Glass Rail Sections, in Twin Crate.

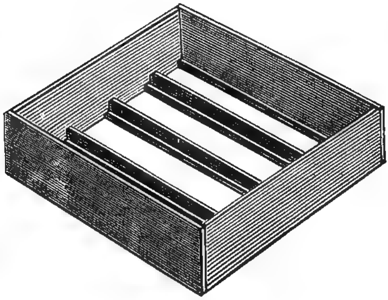


FIG. 30.
Crate, with T Rests.

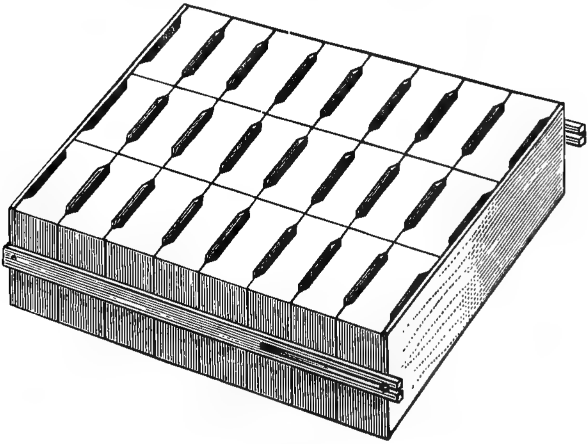


FIG. 31.—Simmins' Simple Rack.

SUMMER.

Where stocks cannot be got up to the desired strength for the opening of the Summer season, or when one wishes to take every possible advantage of the harvest, he will not hesitate to work on the

Doubling System.

At this moment honey may be coming in rapidly, with every appearance of fine weather to continue. The first is always the best chance, and it is a question whether the apiarist will simply allow the bees to waste their energies in excessive brood rearing, or at once modify their work in that direction, and direct far greater power towards the "piling up" of stores. What is done must now be done quickly, and though the usual plan has been to simply place the brood combs of one stock with, or upon its neighbor, and saving the queen with the swarm remaining on the old stand, the following definite methods of proceeding will give the highest profitable results. For producing

Comb Honey,

select any two desirable stocks standing near to each other. Unite the entire force of workers on to eleven frames of the most completely packed combs of brood; allow the non-swarming chamber under, and put on supers already filled with prepared comb to the capacity of some 40 lbs., or even more. If the other queen is old, destroy her, otherwise reserve her majesty in a nucleus. The surplus combs can be placed above any pair doubled for securing

Extracted Honey.

In this case, after removing one queen, place one hive bodily upon the other, having first arranged the non-swarming chamber below all. Thus we have three

chambers teeming with life, but at least one other must be added above with empty combs, or odd brood combs that may be left over from stocks united for surplus comb honey. If foundation must be used in the absence of sufficient combs to fill further chambers, then it will be better to alternate frames of comb and foundation, to secure the more rapid completion of the latter.

Where extracted honey is to be largely worked for,

Surplus Brood Combs

are the most valuable stock-in-trade the bee-keeper can have, if he only takes care when out of use to keep them in a dry store with free ventilation, and all vermin excluded.

Where the producer confines himself to shallow extracting combs,* especially if these are all drone combs, his manipulations are restricted and his honey results seriously curtailed.

A Great Evil

noticeable in nearly all apiaries is the absence of any attempt to keep on hand a supply of surplus stock chambers. In calling attention to this I have no intention whatever of seeking accommodation for swarms, but have in mind the best means of restraining them, and making far more profitable use of the ever swelling numbers in the mother hive.

What reasonable man can for a moment imagine he is to secure large results from the one brood chamber which still constitutes the rule in Modern (?) Bee-keeping?

A hive which does not permit of rapid extension either above or below the original brood chamber, by the season-

---

* The largest yields have been secured by using standard brood frames in the extracting supers; 360 lbs. in the West of England and 357 lbs. from one colony in the East.

able addition of other like chambers always held in stock, is one more suitable for fire-wood than progressive bee-culture.

Further detailed management for the Summer season will be found fully explained in the following pages, where separate chapters are devoted to the various necessary proceedings.

Solid masses of capped brood, with a crowd of hardy mature bees, and many young hatching, will induce the rapid development of further new combs packed with brood, while using frames having guides only along the top bars; and these placed one at a time between such solid capped brood.

CHAPTER XVI.

THE ART OF PLUMPING;

OR, RAPID INCREASE IN SPRING.

A NEW term applied in bee-culture by my pamphlet of March, 1894, was that of "Plumping," a process whereby one or more colonies of bees can be supplied at once with a large complement of brood in Spring; nuclei can be helped during the Summer, or backward stocks strengthened when Autumn arrives.

It may surprise my readers to know that the most prolific queen ever reared can be worn out in six months.

How is it Done?

As soon as natural pollen comes in freely, a stock is carefully arranged so that it completely crowds three combs. Two of the combs have plenty of young hatching from large patches of brood, while the central frame has a part or whole sheet of foundation, or a wax-guide only if it be early in the season.

This central comb is built out so rapidly that every three or four days it can be removed, with eggs in every cell, each time being replaced by another frame with a guide to

be built out in like manner. But the more important item to consider is the

Special Plan of Feeding,

which is not allowed to fail at any time while honey is not coming in. Slow-feeding as generally practised, is of no avail in producing the largest quantity of brood. In times of scarcity constant and *heavy* stimulative feeding is the only course that can be adopted for this purpose, and that I have found can be carried out only by a *combination* of dry sugar or candy feeding, and a rapid supply of syrup. That is, the dry feeder with moist sugar, or a 4 lbs. candy frame at one side; a frame syrup feeder on the other side—acting as the dummies on either side of the three crowded combs.

This combined process is the only one that can be made the means of forcing the *largest* amount of brood in early Spring, and yet hitherto fast feeding has been condemned, because it has been considered that the bees will then fill up everything with food to the exclusion of brood. With ordinary colonies this is often so; but following the times, bee-keepers have become too closely wedded to the modern practice of using full combs, or sheets of foundation in the stock chamber. Their minds do not travel back to the possibility of making bees build their own combs to far greater advantage, and frequently more profit, without the expense of foundation.

In Spring

therefore, to enable one to get the greatest advantage in brood production, I put in a guide only to the central frame, when by feeding as already shown, the result is astonishing. The queen occupies each cell as the work proceeds, and there being no part thereof occupied by old stores or pollen, each of these new combs will be

productive of more brood than two combs partly occupied by stores at this season. Indeed, in early Spring the old stores, particularly of pollen, are the greatest impediment to the rapid extension of the brood nest. By all means keep such stores in the hives generally, but unless intersected by new combs a stock cannot be pushed on rapidly towards the swarming point. During Autumn and Winter, tough warm combs are a necessity, but as mild weather approaches, and the bees again expand, clean new combs are a convenient medium for producing the greatest possible numbers; but these combs must be constructed while the queen is following with eggs close behind the workers.

The general principles of rapid brood production are now before the readers; but we want the best results without the usual stimulation *of all* stocks, which does not always bring on the happy results expected. Under

The New Process

the object is to prevent this general stimulation, and additional loss of life ensuing thereafter. The great thing is to "Plump," or fill up each stock in rotation, with all the brood it can care for (according to the season) *at one operation*, beginning on the strongest, and so on down to the weakest in rotation; otherwise disturbing none, and feeding none until so "plumped." That is another Golden Rule in feeding operations; always leave the weaker colonies alone until the stronger can help them by brood, and perhaps some sealed stores.

Proportion 3 to 10.

The proportion of plumping to plumped lots will be three to ten; thus each of the latter may receive three new combs nearly filling the frame, and every cell with just hatching larvæ at each operation, each week, or twice a

week, according to the age of the brood, the condition of the weather, or the skill of the operator.

The plumped stocks should be fed rapidly six to eight pounds of warm syrup the evening prior to the addition of brood.

As the Season Advances,

and there may be some danger of drone cells being built in the central frame of those hives being drawn upon by "Plumping," there are several ways of securing all worker combs. First by shifting the hive to a new stand, and so getting rid of the older workers, making a nucleus of them. This is almost as good as giving a young queen, as

Young bees may always be relied upon

to produce only worker combs, no matter what age the queen is so that she is not really worn out. Otherwise full sheets of foundation may be given as fast as others are filled with eggs. Old combs will never give the same amount of brood, as so many cells are immediately filled with food ; but while comb-building is the order of the day, the queen is also under a greater stimulus to do her best.

Where several stocks are forced for comb-building and brood production each stock that is "Plumped" in rotation may be given a full complement of brood within a few days. The bees that are present on the first return of Spring are usually half gone before a good brood nest is developed. By the new process the brood nest is extended before many of the old bees fly in earnest. It must be remembered that

Brood makes Brood ;

and therefore, the forced lots, rearing the brood for "Plumping," other colonies must always retain the two combs of brood at either side of the new comb being

built: the work must not begin until the two combs can be secured with hatching brood, and, moreover, the desired process of rapid work is always most satisfactory when only the three frames in all are used.

Thin Syrup in Spring.

Both the forcing lot, and the stock plumped are supplied with thin warm syrup, using one-fifth more water than for winter store. This is in addition to the permanent candy frame required by each lot, and which is the great "stand-by" providing against any possible cessation of the liquid food supply.

Alternative Operations.

One or other of the first selected brood combs may become overloaded with store. In that case an occasional new comb of brood is left to mature, and as the remaining brood hatches from the clogged comb, the latter is placed behind the dummy, as a substantial reserve for the bees to appreciate, as they certainly will.

As the forced or Plumping stocks develop towards Summer some of the syrup may be left off, and the dry feeder or candy will be the main stay, until bees are gathering natural stores. By beginning first to "Plump" the strongest, the weaker lots come in for "hatching" brood before they need be stimulated at all.

Producing Worker Combs without Foundation.

A method of producing new and straight worker combs without foundation was mentioned in the earlier editions of this work, especially as regards utilising strong nuclei during the Summer for this purpose.

As the Autumn approaches, it is desirable to use the brood when mostly capped, and finally for building nuclei into stocks brood that is hatching is to be preferred.

Even one such comb will often set up a fair nucleus as a moderate stock.

Can a Single Stock Plump Itself?

It is sometimes objected that the process is not possible with only two or three stocks in an apiary. Nevertheless a single stock may plump itself by the same method of feeding. When fairly strong make a swarm as shown for "Swarming without Increase." Continue the process of feeding with the swarm on foundation, and re-unite with the young queen.

While the bees' natural preparation for swarming may not always be prevented, the act of swarming can certainly be controlled so that a larger yield shall be ensured.

The Expert will risk his reputation as a bee-master upon his ability in so directing this natural disposition of his workers that he shall be a gainer and not a loser thereby.

CHAPTER XVII.

SWARMING—ITS CAUSE, ITS CONTROL AND PREVENTION.

SWARMING, when uncontrolled, is undoubtedly one of the greatest hindrances to honey production; it is in fact a stumbling-block with a vast number of bee-keepers, who lose the best part of the season before the bees can be induced to re-enter the supers which had been left in an unfinished state when the swarm issued. The act of swarming should be so controlled that work is not hindered, but the average owner appears to prefer increase to consolidating his working force.

The primary cause of swarming is to be found in the completion and over-crowding of the brood-nest. How can this be proved? (1) Very small skeps are productive of numerous swarms. (2) The ordinary ten-frame Standard hive which accommodates more than double the contents of such skeps, seldom throws off more than two swarms when working for comb honey. (3) But when extracted honey is to be secured, so many more combs can be given than are occupied with brood, that swarming is of even less frequent occurrence. (4) Going still further, where very

much larger frames of comb than the Association Standard are used in the stock chamber (such as will absorb the contents of three or four skeps), yet a smaller percentage of swarms will be found to come out. (5) Where bees take up their abode in the walls of old houses, under the weather boards or tiles, the combs are often so long (I have found them three feet in length) that the queen is not crowded, and the brood nest is, as it were, never complete. Under these conditions a swarm is seldom known to issue; indeed I have not heard of one from the many stocks of this kind that have come under my notice.

Following up this process of reasoning, and after experimenting in various directions, I have found the most effective means of prevention to be that of providing a secondary-chamber, under the stock, and which is never filled with finished combs. This arrangement, as regards ordinary hives in connection with other essential features hereafter explained, constitutes the only method of prevention that can be founded upon those natural principles which govern the actions of the inmates of the hives.

Simmins' Non-Swarming System.

This method of management was first made public by the exhibition of my Special Prize hive in 1878 at South Kensington, and later by the issue of my pamphlet on the subject in February, 1886. An immense interest was created at the time, and many copies of the work were distributed by the late T. G. Newman, then editor of the *American Bee Journal;* while large sales were effected in this and other countries.

In that work I claimed that "*No colony in normal condition attempts to swarm unless it has all its brood combs completed*": and further: "To reduce the matter to a greater certainty, while admitting that bees may sometimes

swarm if such space and incomplete *brood* combs happen to be situated at the back, or the point furthest from the entrance, the author *insists that the open space and unfinished combs shall always be at the front, or adjoining the entrance.*" That is, at the front where long hives are used; or between (*and under*) the brood nest and entrance where hives are tiered up one above the other; the latter plan always being the more satisfactory for general working; and as now perfected in the Conqueror hive.

With this hive the supers are *started* under the stock, and then moved—above—with the clustering bees, just as soon as work is proceeding therein.*

The idea has long been fixed

in the minds of bee-keepers that unless the bees were *crowded* into the supers, and overcrowded in the stock chamber, nothing would induce them to work in these supers or surplus receptacles. The same idea remains to-day, fixed as ever in the non-progressive minds of the majority of teachers, and of a vast multitude of others who will probably wait, to make room for more enlightened successors before the grand idea of surplus unoccupied space, in addition to surplus comb-building capacity becomes generally acknowledged as one of the first principles in the production of a large surplus of honey.

An important item

in the new management consists in supplying every section with worked-out combs, and these prepared just prior to the current honey season, so that the bees are induced to store above rather than build to any extent either in front or below according to the style of the hive in use.

---

* Comb-honey should never be completed under the stock, and the Author has on no occasion advised such a course.

If through any inattention to the supers, or a sudden influx of honey, the bees have no room above, no time is lost, and they can go on building below. Nevertheless, these frames with starters must never be allowed to have finished combs, and should any be nearing completion they are to be cut out to be used in the sections, first extracting the honey, if any, and exposing for two or three days those which may contain eggs, that they may be removed by the bees when such combs are returned.

Bottom to Top.

It is much better, however, to adopt the plan of working as used in the Conqueror hive, lifting the crate of sections above the stock as soon as the bees are clustering and working on the foundation.

Causes of Failure.

So many questions are put forward by those who fail to prevent swarming that without enumerating all, I will refer to the main points and endeavour to make the matter clear to my correspondents. I do not propose that all the benefits which may be derived from my system are to be attained by simply using the Conqueror, and then just leaving everything without further control.

The principal causes of failure generally brought to light, after examination, prove to be—(1) Want of sufficient ventilation. (2) Using excluder zinc between the stock and super. (3) Not starting the supers with prepared combs. (4) Not removing the surplus as ready, and so failing to keep the bees at work in the right direction. (5) Not using the new combs when started below the stock for super work, or, with the Conqueror hive, not moving the lower super above the stock. (6) The failure to keep young

and vigorous queens. (7) Stocks too backward to start early work.

Taking in detail the points thus enumerated—

(1) "WANT OF SUFFICIENT VENTILATION." With a strong colony in full swing during favorable weather, the entrance should be fully open, and if necessary, the cover raised. I cannot imagine a well-found colony with a young queen attempting to swarm from the four extracting chambers of the Conqueror when thus ventilated, or from the comb-honey chambers as presently mentioned.

(2) "USING EXCLUDER ZINC." This is an impediment from my point of view, and has much to do with preventing the bees working in the supers and so bringing on a desire to swarm by over-crowding the stock combs. I have always insisted upon the rule that the best queen-excluder is the early and powerful colony; and with such the queen has no chance to rear an excess of, or mis-placed brood when honey is to be found. This assertion finds ready support from prominent writers.

Nos. 3, 4, and 5 are all related to each other in the order given, and tend to cramp the bees for storage room where most wanted, at the very time the owner should be prepared with all the available cells for storage.

I also find that 6 and 7 are very closely connected. Young queens or the stocks possessing them are less inclined to swarm; generally winter satisfactorily and start off in very good condition in the Spring. I repeat it is the backward, and not the powerful early stocks, which give the most trouble in swarming, and if, as usually happens, the late colony has an old queen and comes into full condition about the middle of the honey flow, nothing will prevent the issue of a swarm, unless the queen and all cells but one are destroyed. On the other hand the forward stock with a young queen begins to store from the first, and

with the advantages offered by the above hive, there is seldom any inclination to leave work just for the pleasure of swarming.

Virgins to Supersede Fertile Queens.

It has been claimed by a number of writers that the issue of swarms may be prevented by introducing a virgin queen to populous colonies; when the reigning queen is destroyed, and also the queen cells when any had been started.

An Australian bee-keeper considers this plan is not effectual where the original queen is under two years of age. He, however, uses the process so that both old and young queen may work together, as Italians will frequently do. The old queen is more likely to be destroyed where blacks or hybrids are used.

In the latter case it would be somewhat risky leaving a number of valuable stocks with a virgin queen during a spell of bad weather, and the plan is in other ways subject to much uncertainty.

The Working of New Combs in Sections

with the author's hanging-chamber hives is now more satisfactory, while the cutting of them for fitting into sections can be entirely avoided by the use of his completely divided sections and section holders, as provided in the original Conqueror hive, class C.*

When it is desired to draw out the foundation before placing the divided halves in position, a sheet is attached to one side of each *alternate* half of the section frames; or, in other words, only one-half of the sectional parts required, being furnished with foundation attached to the inner-side, a shallow chamber is filled up with them, and placed next

---

* See illustrations of halved sections and holders; also manner of inserting the foundation in a line of three-side-cut sections.

above the stock chamber as early as the bees can possibly be induced, by warmth and careful feeding, to work out the foundation rapidly. Any kind of hot water vessel placed above, especially at night, where it can be regularly attended to, will induce rapid work, so that three or four days only need elapse before the foundation is sufficiently worked out for removal.

The removed set may be placed above the quilt, and the section halves adjusted as soon as the bees go down, if not shaken off in the first instance. Another set may follow close on the brood nest, and when the season fairly opens these new combs will prove a remarkable stimulus, while the bees will then be strong enough to start other foundation in the lower chamber, used for the time being in place of, or next above, the swarm preventing chamber.

When the section halves are placed upon either side of the newly built combs, simple pressure under a board will fix all securely.

When combs are completed, remove the halved section holders and clear away all odd wax and propolis. Each set of three sections may be handled as one, or, if preferred, then divide with fine wire.

The True Principle of Management

consists in so manipulating the supers that none of the frames or sections arranged below the stock have finished combs all the season ; *i.e.*, they must be removed and used above as fast as the bees make a start thereunder.

The space below or in front of the brood nest gives ample ventilation, keeping the hive cool ; and the stock chamber being, as it were, duplicated, but never filled, the desire for swarming does not exist.

As will be seen, the system is particularly applicable to the production of comb-honey, and without doubt is a

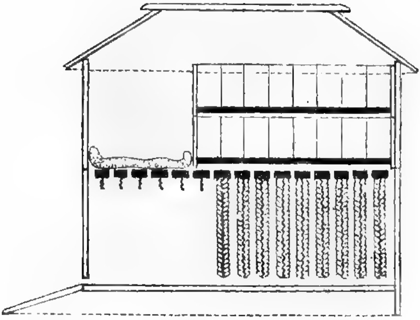


FIG. 32.
Non-swarming Plan, as adapted to old style Long Hives.

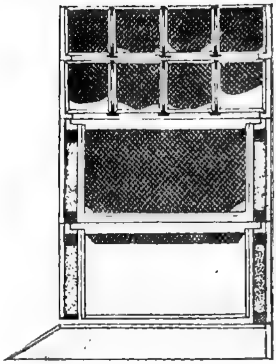


FIG. 33.
Non-swarming Plan, adapted to old style Tiering Hives.

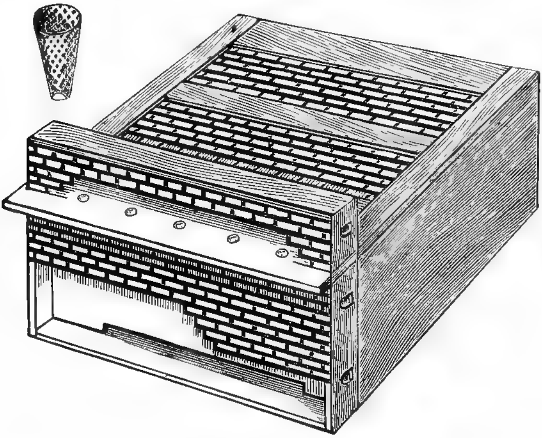


FIG. 34.—Swarm Catcher. Excluder zinc covers the whole front, but cut away to show openings.

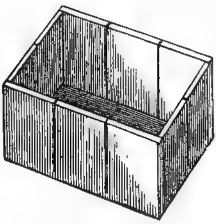


FIG. 35.
Foundation, or Comb Cutting Gauge-box.

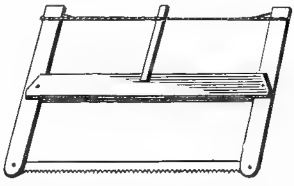


FIG. 36.
Foundation, or Comb Cutting Saw for use with the Gauge-box.

process that will prevent the issue of swarms while securing that article. At the same time it makes a greater certainty of prevention while working for extracted honey, though generally in getting the latter article stored no swarming will occur, as there is no object in having the combs well finished, and unlimited room can be given.*

Another Important Item,

and one always neglected by those who fail to carry out the process, is that a large entrance be provided during the working season. In the Conqueror Hive, the outer entrance is about 18 inches by 2 inches; and a definite regulation of this entrance decides at any time whether the bees shall be permitted to work below the stock, by partial closing; or be forced by extra ventilation below, to finish their work farther away from such opening.

Simmins' Non-Swarming Chamber

has been confused with the ancient "Eke" and "Nadir." The eke was a portion of the lower rim of a skep placed under another similar hive, raising it so that the original combs were then extended *permanently* to within the usual distance of the floor; thus securing additional breeding space in the enlarged combs. No open space was left, and the enlarged combs remained until the stock was finally broken up.

Here was no attempt at prevention, just as there was none in the case of the "Nadir," which was a distinct frameless chamber placed under the original stock, whose combs could not be extended because of an adapting board between the two. This "Nadir" was always given as a surplus chamber, wherein the bees built solid combs of

* The Conqueror Hive was introduced in 1888 as the final development in successful and easy management in checking the swarming propensity.

newly gathered honey. Thus in both cases the receptacles were *filled* with comb for the respective purposes, unlike the Author's non-swarming chamber, which is never allowed to become crowded with combs. The Author has always insisted that no comb-honey is to be produced under the stock, as a finished article.

While many consider that they have no need to prevent the issue of swarms, and can obtain better results by allowing one swarm to each colony, there are many districts where the season is of short duration, and the largest surplus is only obtained by prevention. The system, moreover, should be of advantage to all, enabling increase to be made at the most fitting opportunity; and not, as is too often the case, just as a good honey-flow is on.

My non-swarming system is illustrated for the better guidance of the Reader, both as regards the hanging-chamber hive, and the common close-fitting hives. Figs. 5-23-24-25 represent the Author's hanging-chamber hive. Fig. 32 shows the manner of proceeding where long hives are used, with the empty frames arranged on the same floor, between the brood nest and entrance. Fig. 33 explains the plan adopted when tiering up with the old-style storifying hive, with the lower chamber having empty frames.

The Conqueror Hive

is especially adapted to this method of working, and has stood the test of many years' practical application, as well as adverse criticism from various sources. Its great simplicity of management when understandingly applied, has been its greatest recommendation, and a mass of independent testimony has finally established its reputation as the most rational method that can be adopted for the suppression of swarming, and as a safe guide to the bee-keeper of to-day, and of the future.

Other Methods

have been tried for preventing the issue of swarms, since I introduced the term "Non-Swarming System"; but all have come short of the desired object through incorrect application, and a failure to understand the needs of the case; requiring constant attention and more labor than usual; while at each operation, whether in using a double hive with a revolving motion, or shifting the entrance from one chamber to another by other means, the entire economy of the hive was disturbed, unless inter-communication was allowed as in the Double Conqueror hive.

Swarm Attachments

for securing swarms, when they issue, were devised by me in the year 1888, and for some years similar contrivances have been mentioned both in English and foreign journals though complete satisfaction seems seldom to have been attained by their use.

I still adhere to my non-swarming plan, or that which helps to restrain bees from the *desire* to swarm, as being by far the more simple and effectual, but as there are many who for various reasons are unable to control swarming, I illustrate my earliest design in Swarm Catchers (Fig. 34), which requires little attention when once in position.

It is simply the arrangement of my usual swarm preventing chamber under the brood nest, with a floor between having a central opening covered with excluded zinc. The whole front of the lower chamber is covered with excluder zinc, set out 1½-inch, and reaching up to and covering the front of a porch which comes in front of the main entrance.

The alighting board has here several inverted cones so inserted that the queen failing to make her way out with the swarm finds a passage into the lower chamber from which she cannot return, and where the bulk of the swarm,

after vainly seeking her abroad, re-assemble and go on to work. If allowed to continue there they work in connection with the original force; but, in this case, all surplus queen cells must be cut out, and the zinc removed from the upper entrance that the young queen remaining may leave for her natural purposes.

As young queens will be hatching within nine days, the original stock may otherwise be removed within that period, replacing the supers over the swarm until the bees may be re-united with the young queen as in "Swarming without increase."

A similar plan of treating the swarm and stock (without the swarm catcher) has been recommended more recently by the late Mr. Alexander, of America, and others, as a new development, but no attempt has been made to re-unite the total force with the young queen.

Two or more Queens in Tiering Hives.

The illustration first given in my 1893 edition will show how two or more queens can be worked with stocks one above the other. The bees are first united by leaving a sheet of woven wire or small-hole zinc between the stocks for a few hours; but the tiering plan is not so simple or convenient as the Double and Treble hive management described in Chapter XIX. (See also Fig. 12.)

THE CONTROL OF SWARMING

By Division, and Re-uniting with Young Queens.

Except in the few districts where the season is protracted, increase is obtained at the expense of honey, but in any case it is not desirable to take more than one swarm from the old stock; and this division, to give the best results, should be made either before the first honey-flow occurs, providing the colony can be made strong at that time, or

during July, when little work is generally being carried on by the bees in most districts. But, that we may allow for uniting in the Autumn, it will be safe to reckon only upon 50 per cent increase, as it is imperative that all be kept in good condition. In the table of estimates this has been placed at a much lower rate, so that there is little fear of the apiarist weakening his stock.

A division of stocks can also be made during any interval of dearth, if not too late in the season, but in any case a young queen should be on hand. The operation of

Dividing

will consist in removing from a strong colony one-half of the brood combs containing mostly hatching brood, with the bees clustering thereon, as well as the queen; placing these in a new location, with all the brood near the centre of the hive with empty combs or foundation on either side of the same. The brood combs remaining on the old stand are to be alternated with foundation, as the larger number of bees will be here, and on the evening of the third day following, unite with them the nucleus having a young queen, or insert the queen alone if the nucleus is again required. The reason for waiting three days in this case is solely because of the bees returning from the removed portion which may not always be friendly to the queen which they know is not the one they have just left.*

Having their own queen, there are not so many bees leave that portion placed in another situation, and possessing the older brood the hive will soon be crowded, when the outside sheets of foundation are to be inserted one or two at a time in the centre of the brood nest. The number of frames to be allowed for breeding in divided stocks will

* When starting the swarm without brood combs it is better to leave the queen on the old stand.

depend upon the approach or return of the honey-flow, and it may even be necessary to remove some of the least filled with brood, where comb-honey is to be worked for, crowding the bees on to eight or nine of the combs most densely packed with brood.

Where increase is needed the better way is that of building up to at least two full chambers, and then divide into single chambers. I formerly practised

Contraction

both in Summer and Winter, but with the institution of my non-swarming system it is found unnecessary either for Summer or Winter. When increasing, however, it is the only way to make the most of the honey harvest, by thus curtailing the powers of the queen in less populous colonies. Treatment for either comb or extracted honey with divided stocks will be as before mentioned; but where

Natural Increase

is permitted, the plan of proceeding will be somewhat different. Constant care and attention is needed where swarming is allowed, and if due precautions are not taken the prospects of a good harvest are ruined. In the first place we will consider my own method of

Swarming without Increase.

In the earlier days of the *British Bee Journal*, I was on one occasion challenged to show how swarming could be carried out without allowing increase of stocks. I immediately accepted the challenge, and gave my plan of swarming without increase; and the same method was afterwards fully explained in my pamphlet of 1886. It consisted in either making an artificial swarm, and presently re-uniting; or could be adapted to natural swarming.

Where a swarm is not seen to issue, a glance around at the entrances of the hives only should show the bee-keeper

from which it came. Hitherto, all was life and activity, but look! here is one hive with the entrance clear of bees, and but a few returning, while hardly one is seen to issue; it is the "calm after a storm." A closer inspection of the hive will reveal the true state of affairs, and now remove all but one or two of the combs to another hive standing by the original, with the entrance turned away from the same. Secure the swarm in a skep or any other convenient article, standing the same upon the ground with clear space for ventilation under, and shade above. As soon as most of the bees have entered or clustered about the skep, carry the same to their original location and shake them into the hive, having previously arranged six or seven frames with full sheets of foundation, or $\frac{1}{4}$-inch strips of such; and not more than two frames of brood near the centre, with dummies at either end. It seems hardly necessary to advise my readers that no queen cells should be allowed on the two combs of brood given to the swarm. Any attempt at forming such should be discovered when occasionally adjusting the new combs being built.

The sections are to be replaced on the new swarm which will soon receive so many bees in addition from the removed combs that the remaining population will give up any idea of again swarming, and will destroy all but one queen. When the latter is mated and laying, the brood will be hatched, when the old queen left with the swarm is to be destroyed, and on the third evening

Unite the Parent Stock and Swarm *

* Stocks showing early symptoms of Isle of Wight disease if swarmed and re-united in this way, will overcome the trouble with but little other assistance, and will become more populous and vigorous. In this case the swarm should be hived without quilting and left in that condition until supering.

with the young queen presiding. The united stock should not have more than ten or eleven frames in all if comb-honey is desired, while the remainder of the broodless combs can be used for extracting purposes.

When more than one young queen may be desired, break up the removed combs into the necessary number of nuclei with a queen cell to each on the eighth day after swarming, and re-unite as soon as the queens can be appropriated.

For obtaining one swarm from each stock, and in desiring to

Prevent After-swarms,

proceed in the same way, except that the removed combs and bees are to be placed at a distance from the old position, and no uniting takes place. This plan of obtaining one swarm and throwing the whole working force with the same, while making it a certainty that the other portion will cause no trouble was well known to, and practised by, most of the old masters. In this case, there is no time wasted in cutting out queen cells, an operation that cannot be tolerated in a modern honey-producing apiary. Should there be any fear of the bees being strong enough to swarm again, a few more shaken off with the new swarm will settle that matter. As soon as the young queen, or one already on hand, has six or seven combs crowded with brood, supers may be placed on her hive also, at the same time giving two more empty combs or foundation near the centre. Upon removal of the sections there will probably be hardly an ounce of honey in the stock combs, when another empty comb or two must be inserted and feeding be followed up, so that the brood nest is gradually reduced and the combs stored for Winter.

Combined Swarming and Doubling without Increase.

In my 1886 pamphlet, page 29, under "How to Control Swarming," I described my method of avoiding increase, while making swarms and securing immense populations, thus: "Select any two strong colonies . . . no matter how far apart, remove from one all the brood combs but two left in the centre with no queen cells; give their own queen and fill up with three frames, having guides only on either side. Now return *all* the bees by shaking and brushing from the combs, and also one-half of those bees from the second colony. On the third day remove the old queen, and insert one of those recently fertilised. Then put on supers of a capacity of not less than 40 lbs. at one time, with all sections *filled* with combs. As soon as the upper set is completed, remove, and insert another in its place, though if the weather is promising, the district good, and the season still young, it would be much better to place the empty combs under that crate remaining. . . . If the apiarist is working with such stocks as alone give a profit, a large super room should be given *at the start* . . . but cramp them to begin with, and they are cramped in every way to the end of Summer.

"Returning to the second hive, which had been deprived of half its bees, we place above them another hive containing the remainder of the brood combs from No. 1, filling up with empty combs or starters on either side. First arrange a hive with guides only at the bottom, and proceed as previously mentioned for extracting. The old queen in this case is not to be superseded until all surplus has been removed, when the nucleus reserved for them may be united to such colony, and the combined forces fed up for Winter, if more stores be needed.

"By the above, though with more labor, all the advantages of non-swarming are obtained, and neither stock

hive (whatever distance apart) is moved from its own stand." Modifications of this method of

Doubling Swarms and Uniting the Parent Stocks

can be secured by using the whole of the flying bees of two stocks near together for making the new swarm, and then arranging the stock combs as another colony, as before. The other alternative is that of doubling the stocks as they are with the whole of the combs, bees, and brood, not forgetting the great point of supplying a young queen at the time.

Now is it not strange that prominent bee-men, year after year, are still straining after some method of controlling swarming. My pamphlet, from which the above is taken, was sold largely in this country and America, and prior to its issue no mention of a non-swarming hive or system had appeared in bee-literature of the period. Only quite recently our American friends have been exercising their minds over artificial swarms which they propose to call "shook" swarms, because they shake off part of the bees from the combs of a stock to form a swarm to be hived upon starters or full sheets of foundation; thus in attempting to control swarming they make

One Strong Stock into Two Weak Ones,

a process which no advanced *bee-master* should tolerate.

Bees can be so easily united during a honey-flow that it seems hardly credible any honey producer can fail to see the advantages of uniting the double swarm near the old stands, and the two old stocks on a fresh site. This does away with any necessity of weakening a single colony in preventing swarming, and it is the basis of vast honey yields.

To those who wish to work their ordinary hives to the best advantage, I may say that

The Young Queens

mentioned are first reared in nuclei, one is given to the united swarm soon after the operation, for two reasons, one being that no further swarming will occur, and another, that all worker combs are more likely to be built by the bees. In the case of the old combs doubled on a new site, the bees are not likely to swarm with so much comb space allowed, and the young queen with her nucleus is *added* to the stock in Autumn.

Throughout all bee-operations the fact must never be lost sight of that every manipulation must tend towards developing that vast population at the right time, so absolutely necessary to a great success.

Taking the average of seasons, one eleven-frame British Standard (14in. by 8½in.) stock chamber, crammed with brood prior to the honey-flow, should yield 75 lbs. of comb-honey; one eleven-frame Langstroth (17⅝in. by 9⅛in.) chamber, 90 lbs.; one eleven-frame (16in. by 10in.) commercial stock chamber, 120 lbs.*

The progressive increase of surplus when a second chamber is filled with brood and bees by the same queen, is three times that secured from one chamber. Extracted honey may be shown as one-fifth more than comb in sections, as compared with the above estimates.

CHAPTER XVIII.

THE PRODUCTION OF HONEY

AS AN ABUNDANT SURPLUS.

IN endeavoring to secure large yields of honey the bee-keeper is obliged to rely upon a vigoros strain of bees, and correct manipulation at the proper moment, in connection with commodious hives and the early development of a vast working force.

Liliputian, incomplete, and makeshift hives, such as frequently used, are unfit for profitable bee-keeping on a large scale, and account for many of the failures recorded.

Large Brood-nests prior to Supering.

One should breed by selection, or otherwise procure queens that can fill nearly solid with brood, the equivalent

* The form of the commercial frame ensures a more compact brood nest, and a much larger population.

of three British standard eleven-frame stock chambers prior to the main honey flow. Oh, yes! this will wear out any good queen in one season, but the cost of a queen is nothing as compared to a yield per stock *in one season*, equal to that more frequently procured over a *period of three years.*

"No queen can do that," says the reader! But it has been done with a result up to nearly 360 lbs. of extracted honey from a single colony. The methods of management, showing how to work double or treble stories of brood, with either one, two or more queens, are unfolded herein.

Native Queens and Bees a Failure.

In extra good seasons many owners working with native bees allow the smaller standard frames to become largely choked with pollen and some honey, using one stock chamber only; hence the yield is very considerably smaller than it should be.

The larger, deeper frame is not so quickly restricted in this way, even under inferior management, while the double chambers, when filled with brood quite early, will result in heavy yields.

When supering, one of the two stock chambers (or two if there are three) will be removed to one side, and, as repeatedly explained in this work, the removed portion may be used to swell the numbers of the actual working stock in due course; or at a later date may be supered separately if the division should have been made quite early.

The non-swarming chamber may be either a comb-honey or an extracting super for the time being.

What is meant by Honey Production?

Do you know what it means to become a producer of honey, a producer on a large scale, a king among honey-producers? You will certainly not then leave each individual colony to just do its best upon its own merits, its

own basis of strength, and doubtful possibilities. No, you must do the acting—*you* must be a man of action.

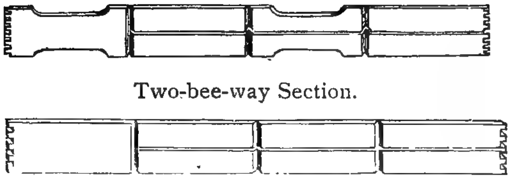
Why should you put down a colony of bees, simply place on a super when you think the fine weather has come, and so secure your 30 lbs. or 40 lbs. of honey, or less—or none at all, when on the other hand a rational manipulation on your part will reward your endeavors by the 100 lbs. and more, to each hive.

Keep the brood nest freely open for the queen, so that her egg-producing powers may not be restricted, and see that the supers are fully expanded for storage. Cramping gives poor results, but a large hive, with large surplus room, will always, and will alone, be productive of heavy yields.

A large frame for brood-rearing, and a prolific queen of a good strain, will provide an immense force of working bees. As previously shown there is no reason why a queen should be restricted to one brood chamber prior to the honey-flow, while "doubling" may be resorted to if necessary in an emergency.

When Honey Flows.

Many novices ask how they are to know when honey is coming in. Examination of the combs will, of course, show every vacant cell being more or less occupied with the thin newly gathered nectar. The bees, too, come in with distended bodies, falling heavily upon the flight board. Sometimes the aroma of the incoming stores is distinctly noticeable, more particularly at evening when many bees are ventilating at the entrance, and a perfect roar is heard throughout the apiary. Apart from this, the advanced apiarist has an instinctive feeling that honey is, or is not, being gathered. The state of the atmosphere and his knowledge of surrounding crops tell him at once what to



Two-bee-way Section.

Fig. 37.

Plain Three-side-cut Section. Introduced 1886.

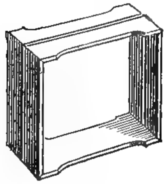


Fig. 38.

Two-bee-way Section, folded.

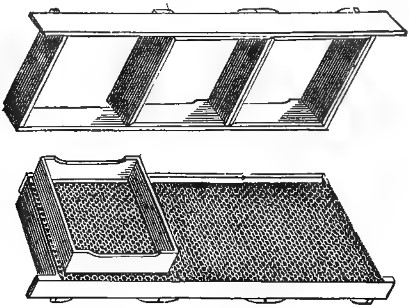
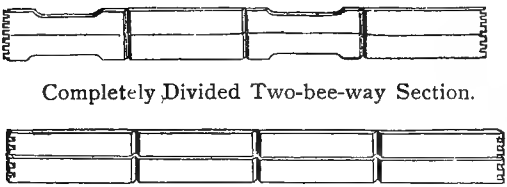


Fig. 39.

Simmins' Divided Section Holder, and Halved Sections (1889); showing how the sheet of foundation is placed across three Sections.



Completely Divided Two-bee-way Section.

Fig. 40.

Plain Completely Divided Section in the flat. Introduced 1889.

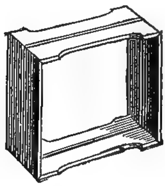


Fig. 41.

Halved Section, folded.

The Author's Three-side-cut Section was first illustrated in his 1888 edition. His completely divided section and divided holders were introduced in 1889, and illustrated in the 1893 edition.

The plain (no-bee-way) section, Figs. 37 and 40, are from original engravings cut in 1892, and the Author's preference for no-bee-way or plain sections was first mentioned in the *British Bee Journal* some eight years earlier. It appears that plain (no-way) sections were first made by G. B. Lewis, Watertown, Wis., in 1882.

expect. The temperature may range anywhere from 70° to 90° in the shade, but if it continue too hot and dry for more than ten or fourteen days, the amount of honey brought in will decrease daily, unless there happen to be a succession of heavy ground crops coming along, when, the earth being shaded, moisture is still retained. A shower once in a while is beneficial, but frequent rainfalls destroy all chance of a good honey flow, as such are accompanied by a lower temperature. Even with fair weather it sometimes happens that the temperature rules too low for the secretion of nectar ; but usually if none is stored during a fine season, it implies either that the district is poor in honey plants, or else that there are too many colonies in one place.

Now, dear Reader, granted you have the most suitable hive, and the best bees for the purpose, and moreover have carefully studied how to secure your strong stocks, and then how to control their natural inclination to swarm, you are, I trust, fully prepared to gather in a very large proportion of that delicious sweet so abundant all around you.

EXTRACTED HONEY

is that which is removed from the combs by centrifugal force, without breaking them up ; while the liquid is consequently clear, and of far superior quality to that which by old-fashioned methods was obtained by straining the whole mass of honey, pollen, and larvæ, through a cloth.

A common practice is that of removing the honey before the cells are capped over, and large weights of such "green stuff" are often boasted of. As a matter of fact, however, such honey never equals that left in the upper tiers or supers until thoroughly "ripened" by the natural heat and perfect ventilation of the hive. When the combs are at least two-thirds sealed they may be removed, and the

contents extracted, when generally an article of good consistency will be procured.

In the artificial process of ripening, "green" honey loses considerable weight by evaporation of the excess of water, and being passed over a series of heated plates its quality is impaired, and is, of course, inferior in every respect, as both

PURE ENGLISH HONEY

SUPPLIED DIRECT FROM

THE PRODUCER'S APIARIES.

NONE BUT PURE HONEY GRANULATES; when this has become so, it can be made liquid again (if desired) by placing the jar in another vessel containing hot water, when it will become as when first sealed up.

NOTICE.

I GUARANTEE this Honey to be quite pure, and free from the usual impurities of old-fashioned "strained" honey.

This is "extracted" from the combs (without being broken in the least), by the aid of centrifugal force; hence its superior quality.

(Signed)

the color and usual characteristic aroma of honey is destroyed. The best article only is that which will create a demand; and that must be such as is largely ripened within the hive. This is judged, with few exceptions, by the completion of the sealing.

Bottled Honey.

In glass the wholesale demand is generally for 1 lb. jars. A popular kind is the jelly glass, and being so largely used the manufacturers are of course enabled to place them at a lower figure than any other kind. They are neat, elegant, and with a nice label, most attractive, costing 10s. 6d. per gross; with corks, 12s. 6d.; so that including carriage,

bottling, &c., the total cost is a little over 1d. each (Fig. 50). Half and quarter-pounds can also be retailed at home, but are useless to the trade.

The bottles illustrated are especially suited for honey. Fig. 52 makes a good exhibition bottle; 50, the Greek design jelly glass; 51, a bottle very much appreciated by customers generally.

For bottling, the honey must be particularly clear; and whatever shade of color it may have,* it should be bright and in all cases, as before stated, of such consistency that it "piles" up well when drawn off.

Fill all bottles as evenly as possible and cork up at once, driving the latter home with a mallet, while holding the bottle in the left hand clear of any bench or shelf. Having filled your bottles, of course those with corks need some finish, and for capping the whole, nothing is more simple and inexpensive than

Sealing Wax;

but this article must be made at home. Procure common yellow resin and heat it above a small oil stove in an earthenware vessel, or if prefered a large glue pot. Use one part of beeswax to three of the other to toughen it and make it hold to the glass. Now an important item is the color of the sealing wax. A *bright* color will contrast well against the contents of the bottle, and the coloring matters used in common paint answer every purpose. Stir all thoroughly to get an even mixture, but at no time let the wax boil.

---

* Color in itself is not a distinguishing feature of good honey. Heather honey is dark but bright, and commands a higher price than any. Honey-dew is both dark and muddy in appearance, and is of the worst possible quality, and of little value. Some light honeys may be bitter and unsaleable.

To Wax the Bottles

invert them with the cork and upper surface of the bottle just hidden in the heated substance for a moment. The operation can be rapidly carried out, and in lifting the bottles give one or two turns that no bead of wax may run down the side. Now all is ready for the label, which must be of such a character as to contrast favorably with the contents.

Home-made Self-sticking Parchment

for ensuring the air-tight sealing of honey or jam in jars, is an item many of my readers will be glad to know about, especially as it is so economical a process. Common thin paste is used, and into this the paper is dipped so that both sides are moistened. This is then pressed down over the mouth of the bottle and all round the under side of the rim. When dry this is superior to real parchment, no air can get in, and no tying is needed.

Milk, skimmed or otherwise, will also answer in the same manner ; while both of these articles are cheaper, and more easily applied than the white of egg.

Paper similar to bakers' flour bags is suitable for the purpose, and for commercial use a piece of cardboard cut to the right size may first be dipped into the paste and laid over, when the paper over this will make a very strong sealing. Screw-cap jars are expensive, and where a cheaper bottle will answer, this substitute for parchment will be more effectual in preserving the contents.

Canned Honey.

With prices much lower, together with a general and increasing demand, honey in tins is becoming popular. Two, three, and six pounds seem to be mostly in demand, and at reasonable rates large quantities of good honey can

thus be disposed of. Color is not of so much importance, and when granulated this is a good way to dispose of our produce; but the article must be thoroughly ripened, and of good flavor. The most elaborate label that can be obtained is required to make tins attractive.

Bee-keepers frequently complain that they cannot dispose of their honey; but if they only take the trouble to work their own neighborhood at a *selling price* they will be surprised to find that instead of producing more than can be disposed of, they will be unable to supply the demand. Only recently I have been offered honey in considerable quantities at rates higher than what I could myself obtain twenty years ago. Honey has to compete with many other articles, themselves much reduced in value in these "cheap times," and supply and demand must regulate the price.

Having shown how to prepare and market extracted honey, we have yet to consider the best means of obtaining it. First we must

Provide for extracting

by arranging our hives in the best manner for its production. A good stock of worked-out combs is invaluable for this purpose, as we desire to give the bees plenty of storage room; while there is no great necessity that the combs shall be completely sealed.

Those hives only are suitable for extracting purposes which admit of tiering up one above the other. Such chambers may all be of one pattern; though with the stock hive only having standard frames, and that surmounted by successive stories of shallow frames, may be better in some localities. In either case use the empty chamber below, which will also to some extent prevent the queen ascending higher than the brood nest proper.

Perforated zinc is frequently recommended to keep the

queen down, having slots $\frac{5}{32}$in. wide, which presumably admit neither queens nor drones, but its use is detrimental.

Deep hives, with the extra chamber for prevention of swarming, will rarely be left by the queen, and with a careful and judicious adjustment of the stock-combs before supering no adapter will be needed.

All combs arranged for extracting should stand at a set distance apart all the time, as the surfaces will then be finished off evenly, thus making the uncapping process more rapid. It may even be an advantage to use supers with dividers, as first illustrated in my pamphlet of 1886.

All Drone Cells in Supers.

Many bee-keepers follow the practice of using drone-comb in extracting supers, hence they are compelled to use excluder zinc between the stock and supers. Otherwise the drone cells are a great inducement for the queen, at the will of the workers, to deposit eggs therein during the honey season.

The Reader may accept my assurance as an undoubted fact, and one of serious importance, that he loses much surplus by adopting excluder zinc, while the bees are more inclined to swarm when it is in use. It is not only that less honey is carried through this impediment, but also that more may be stored below in the stock combs, thus cramping the brood nest, and curtailing the increase of population.

Metal Ends

are often used on the ends of brood-frames, for spacing at set distances, being barely $1\frac{1}{2}$in. wide. For extracting the ends should not be more than $1\frac{3}{4}$in. without dividers, or 2in. if any form of separator is used.

Where there is any difficulty in restraining the queen, as where all shallow, or all standard frames may be used, and the queen excluder is objectionable, then place all suc-

ceeding sets of combs *below* the brood nest as recommended in Non-Swarming pamphlet; then extracting from the upper set as the brood is replaced by honey.

Mr. Howard designed single strips of excluder slots with plain ⅜in. sides, which can be inserted between the frame bars, thus spacing the frames at the same time, and being adapted to few or many frames. It will be found far better, however, to work entirely without excluder zinc in any form.

The best Queen-Excluder

is the powerful colony, *but* why should you super it just as you find it when you think it is ready, and becoming over-crowded? This is just what the average bee-keeper does, and then he wonders why he cannot do without excluder zinc, and moreover why his bees swarm as soon as they have made a beginning in the surplus chambers.

I must repeat that the numerous teachers who are advocating the use of queen-excluder zinc between stock and super are missing the great principle in honey-production, and general bee-management. Every advancing bee-master should grind this fad under his heel, and will rely upon the

Re-arrangement of the Brood-nest before Supering,

for the purpose of giving the queen plenty of room, while at the same time ensuring a large population. The older capped and hatching brood combs you will place at the centre, while the uncapped brood will be placed to the outsides.* This must be made a great point in management just prior to supering, and then the bees are obliged to carry all the incoming harvest upstairs; while the queen

* Two or three sheets of foundation may be placed near the centre in exchange for some of the heavily stored combs that may be near the ends.

will have so much room below, where most needed, that she will not trouble to shift her quarters; and the outer combs will be so long occupied with brood that the workers will not get into the habit of storing there to begin with. See also the "Control of Swarming by Combined Swarming and Doubling."

Double Brood-chambers.

Where the stock has been developed to fill two or more stock chambers before the honey-flow, these may be left when working for extracted honey.

Old Combs or New.

Many bee-keepers who however produce extracted honey only in limited quantities, appear to prefer white combs for extracting; such as have never been used for breeding. They claim that the honey is cleaner and lighter in color; But this is simply a theory which cannot be supported by sound practice. Now, new combs have little to support their delicate construction, and when these are emptied and stored away the wax rapidly deteriorates, losing its oily nature, so that a wasteful process of renewal is repeatedly necessary.

Tough breeding combs are less likely to break in the extractor, the stored honey leaves the cells more readily; while it is absolutely as clean and beautiful in colour as that from the whitest combs. I have had it so very white from my dark breeding combs in the surplus chamber, that it has been as light and clean as sparkling water, and was mistaken for sugar syrup; and too at a period when no feeding had taken place for many weeks, and the light honey was being brought in by the hundredweights. When we consider that all cells are well cleansed and polished by the bees of healthy stocks before being used as receptacles for honey; and as it is self-evident that the tough combs will keep in

store to far better purpose than the new and fragile combs, while the others may constantly be passed through the brood chamber to keep them in condition, there can be no question as to the greater economy in using breeding combs for extracting purposes.

With plenty of store combs and the " safety valve" below, the bees cannot well be idle if there is anything to be gathered. A common practice is to lift the upper storey and place another under, but where excluder zinc is used the brood nest is always retained at the bottom; hence the bee-keeper's manipulations are much restricted.

No Bees Brushed from Combs.

When removing completed sets, let it be done during the busy hours of the day, when the few bees therein will soon leave if piled up in a room with large windows arranged as explained under Bee-houses.* This, to my mind, is far better than using bee-escapes to supers, and if a bee-house is not available, a large box or other case can easily be set up to answer the same purpose. Another way is to shake the bees from the combs, using a feather for the stragglers; and still another, with shallow frames when fixed securely, is that first adapted to modern hives by James Heddon, of Dowagiac, Mich., who had not the slightest knowledge that his "shaking out" process had been long practised in this country with fixed combs, where we call it "throwing." Still another method of clearing supers is that employed with the Double Conqueror hive.

Empty sets of combs must be in readiness to give the bees where more room may be required, and when full

* This item, given in the same words in my earliest and following editions of this work, has quite recently been offered in the American Bee Journals as a new method of removing surplus.

combs have been emptied they should always be returned in the evening that all may be cleared up, and the consequent excitement subsided before another day's work commences.

Bee-Traps

have been revived both at home and in America, under the name of bee-escapes and super clearers. Some 35 years since these were much in vogue, but fell into disuse, as practical bee-keepers found they prefered, when once having raised the super, to clear it away at once, and it is not a little surprising to find several advanced apiarists themselves entrapped into thinking there is anything to be gained by re-adopting this old and discarded fad.

Carbolised Cloths.

The late Rev. Geo. Raynor used carbolised cloths, both in general manipulations and when removing supers. The cloth, about 18in. square, is dipped into the solution, and laid over the frames or sections, after first wringing out the excess of moisture. No one would use a super clearer after once trying this method.

Well, we have our stored combs in the outer honey house, and now they must go forward into the extracting room, having been cleared of bees. We must first be sure that our

Extracting Machine

is quite clean, and that it has been firmly secured in a suitable place, high enough that the honey may be run off into another large cylinder or tank, which again must have a treacle valve at a convenient height for drawing off. The strainer must cover the entire mouth of the tank, and be placed directly under the valve of the extractor. We now require an

Uncapping Can

which is to be in two sections, one fitting into the other. The upper part receives the cappings, having a strainer at bottom and one or more bars of wood or metal across the top whereon to stand the comb. While resting one end of the frame of comb on the bars, and the upper end held by the projecting ear in the left hand, with the top bar towards you, with a slightly diagonal and sawing motion carry the uncapping knife from top to bottom, removing not only the cappings but all comb that may project beyond the plane of the frame; reverse, and serve the opposite side in like manner, when the comb is to be inserted in one of the cages of the extractor with the top bar standing in a direction opposite to that in which the revolutions are to be made, as the cells inclining towards the top bar, the honey leaves more readily. The uncapping stand (Fig. 46) provides for melting the wax cappings at the same operation. Now, unless the

Rate of Speed

be carefully regulated, the operator is liable to break his combs, and thus render them difficult to handle; but by turning slowly while emptying the first side, the great weight of the other will not force the combs into the wire netting. Now reverse all combs, at first working at a slow pace, but gradually increasing the speed, until you may set the machine going as fast as it can be made to revolve, having already removed the bulk from the opposite sides, though with a steady motion. When at full speed, slip off the multiplying gear if on the horizontal pattern, when a great many revolutions will be made while you can go on uncapping. The combs should again be reversed, and the sides first done are to be rapidly turned

round in the same way. In this manner no combs are damaged, while every drop is obtained; and most of the revolutions take place while the operator is uncapping the next set of combs.

Combs containing Brood

can be extracted from only in warm weather, when the speed required for the first side of heavy combs to prevent them breaking must not at any time be exceeded. With care, none of the larvæ will be displaced, and here again the multiplying gear will give the more even motion. It is safer to extract not at all from combs containing brood.

The Automatic Extractor,

with comb-cages that swing in either direction (as reversed) without removal of the combs, is the most useful form of machine. This was designed by Mr. T. W. Cowan, and is the Standard Extractor (Figs. 42, 43).

Storage, and Ripening in Deep Tanks.*

Our honey is running through the strainer, and presently the tank will be full; when it will be necessary to draw off and again strain into other receptacles, all of which must be convenient for filling smaller vessels as needed. In lieu of lids, the storage tanks must be covered with cloths carefully secured, when the honey will be more perfectly ripened, and after a few days it can be drawn off and will be remarkably clear, with the exception of two or three inches of the upper surface, which may be strained and placed with other surface honey. I have found no harm resulting from honey being stored in galvanized vessels,

* When not intended for exhibition the honey need not be strained into the deep ripening tank (first offered in the Author's 1886 pamphlet) as all dross will rise to the top, and may be skimmed off.

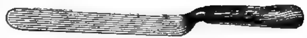


FIG. 44.
Honey Knife.

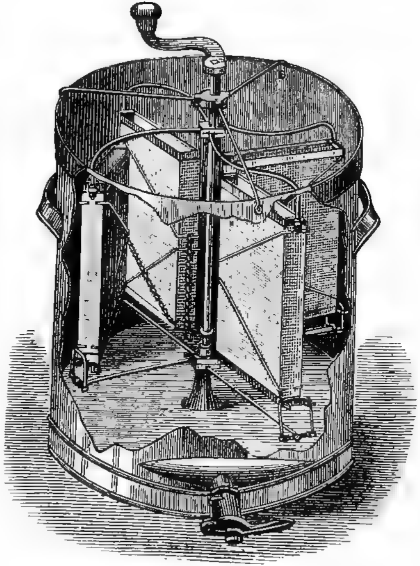


FIG. 42.
Stanley's Automatic Extractor (after Cowan).

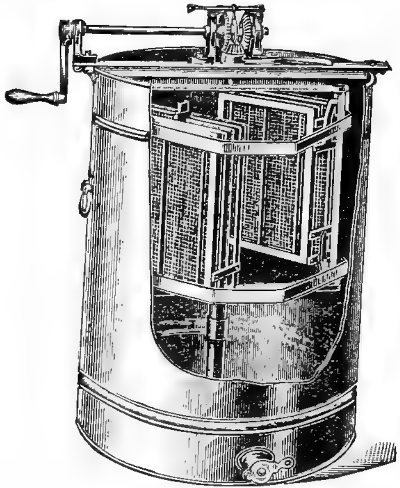


FIG. 43.
Meadows' Cowan Automatic Extractor.

but where it may be required to stay for a considerable time, tanks should be of tin, though more expensive.

The produce of an apiary varies considerably in colour according to the plant it may be collected from, and each kind must be extracted and stored separately, as the different grades have varying values; while one kind may granulate more rapidly than another, and if all were mixed together the entire mass would soon follow the action of the smaller proportion.

To prevent Granulation,

it is recommended that honey be heated to 160 degs. Fahr., and then corked up; nevertheless some kinds will granulate in spite of this. The honey-producer, however, must be very careful that he does not injure his commodity. Honey should never be placed over a fire without the vessel containing it being in another with hot water. Indeed in this case the water may be almost at the boiling point without doing any harm, providing the honey vessel is properly secured that no moisture may gain access. The washing copper to be found in most houses will perhaps be the most convenient vessel for the purpose, of course leaving off the copper lid.

Crates

for bottles should be made to hold either one or three dozen, the latter being most useful, as being the extent of the more frequent order. The divisions are best made of thin wood crossing and halved together, to form square recesses to take the bottles just tight. (See Fig. 53.)

For tins little is needed except a plain strong box of the right depth to take a 6 lb., two 3 lbs., or three 2 lbs.; all of which must be of the same diameter, a point too often overlooked, but an advantage appreciated when

packing a large number, and being able to use one-sized crate for all.

Uncapping Machines

have been brought forward from time to time, but although the Author has devised a perfect apparatus for the purpose, and another very similar has been offered in America, none can so far be manufactured at a price that will encourage the apiarist to discard the ordinary honey knife.

Exhibition of Extracted Honey.

Extracted honey for show purposes must be bright and transparent, enclosed in a bottle having a screw cap, that the contents may be readily reached. The glass should be of the finest quality and the jar as narrow as possible.

Clover and sainfoin honey, also that from yellow trefoil and bird's-foot trefoil, is light in colour; while that from dwarf-thistles is water-white, and has been disqualified by judges as sugar-fed, in their ignorance of this variety.

Apple and pear trees provide little honey, but usually get the credit of produce from other sources that are available at the same time, notably the trefoils, as well as the sycamore. Cherry blossom is much frequented by bees, while plums, apricots, nectarines and peaches, all produce light honey.

Wild thyme honey is rather dark; while that from heather is still darker, and of greater density, but these would be judged upon their respective merits.

Honey from basswood trees would be classed separately, as also mountain sage, and that from the immense irrigated areas of the United States, where nothing but lucerne is grown.

Although several countries may have certain varieties of honey plants in common, there are many that are not found in all. On the whole, however, flower honey is

bright and sparkling, notwithstanding its color or flavor, unless perchance the season or locality may be favorable for the collection of honey dew, which impairs the quality.

Honey Dew

is usually abundant after a fine dry Spring, when the aphis is encouraged to propagate rapidly, and cluster about the young shoots of trees, which become dwarfed and distorted in consequence of the young leaves being injured.

The aphis, usually referred to as "blight," appears to convert the starchy properties of the delicate leaves into saccharine matter,* which they exude and drop upon the leaves that may be below them, and from which the bees collect this unsuitable food when other supplies are deficient.

A wet Spring prevents the unusual propagation of these pests, and a fair Summer usually follows an unsettled Spring, thus the bee-keeper is favored. On the other hand, in this temperate climate I have noticed a particularly fine early season is almost invariably followed by an unsettled Summer, thus compelling the bees to collect the honey dew.

COMB-HONEY

was formerly produced in straw caps, in shallow boxes without frames, and the far-famed shallow Stewarton supers, from which also the combs had to be cut out.

The nearest approach to small combs was found in the beautiful bell-glass supers of various sizes, and the glass and wood boxes holding two or three small combs, as seen in the charming illustration taken from the Rev. Langstroth's work.

---

* In this connection it is well to remark that buds develop sugar from starch while expanding, and the dwarfed condition of the leaves struggling to expand may be attributed to the result of this extraction of nourishment by the aphis.

Then came the four-piece section, quickly followed by the one-piece folding section. The 2 lb. section soon gave place to the 1 lb. size, when there were several attempts to work ½ lb. sections, but these, like the ½ lb. bottles of extracted honey, were soon discarded as being unprofitable.

Simmins' Double Slatted Separators.

The 1 lb. sections rule the market, and these are offered in several forms. The 4¼in. by 4½in. by 2in. section is used between plain separators, setting close to the edges of the sections; and with the Author's double slatted separator, also setting close, but at the same time allowing both direct and intercommunication between. Thus many of the bees may go right up through one super to the next without travelling over the combs.

The 4¼in. by 4¼in. by 1¾in. may be used either without separators or with the single cleated separator.

The 5in. by 4in. by 1⅜in. section, first adopted in America with slatted separators and no bee-ways, was a non-practical adaptation, being too thin. The Author has always advised the use of 5in. by 4in. by 1½in. sections, with the single slatted separator or fence. This section looks better, and being the natural width is worked well by the bees, and averages 16 oz. when nicely filled.

The Author's double slatted separators cannot be used with these tall sections unless they measure 1¾in. through.

In working without separators it is desirable to use a spirit level that the hive may stand true. The sections should also be fitted with full sheets of foundation firmly secured in saw-cuts.

The completely divided sections have reference only to the 4¼in. by 4¼in. size. The tall narrow sections are slit on three sides only.

The Author sold clover comb-honey at 1s. 3d. to 1s. 6d.

per lb. wholesale in the '70's; but at the present time heather honey only reaches or exceeds these figures.

The kind of section one intends to adopt should be on hand before April 1st, when the foundation can be inserted during that month; that all may be in readiness, as a flow of honey is liable to occur any time after May 1st, or even earlier. In

Preparing Stocks for Comb-honey

it has been shown under General Management that the brood nest should be reduced to the capacity of a ten or eleven-frame chamber of combs when supering. It may be asked

Why the Brood Nest should be Restricted

at this time? As a matter of fact, having already a complete brood nest, every day passing without an extension *adds a balance of power to the future working force* of the hive. Continue to extend the brood nest after supering and you not only require a greater proportion of the stores to feed the young, but a larger number of the population is needed to attend to the enlarged nursery instead of adding to the stores.*

It should be distinctly understood that it is not always the larger population which gives the heaviest surplus, as it is possible for the hive of medium strength to send out a much larger gathering force. These are delicate points which require careful consideration but which are too often overlooked.

The First Honey Flow

is upon us; weather steady, and temperature from 70° to 80° in the shade, with plenty of forage in all directions.

* A powerful colony tiered up for extracting, especially where two have been united, will restrict the queen quite as much as is required.

Our sections are all ready on the hives, providing not less than 60 lbs. capacity with combs all drawn out; or 40 lbs. to start with if only foundation is given, or with weaker colonies.

We are now in full working order, and in looking around we find here a hive and there another which require more surplus room, or the bees will in many cases prepare to swarm. Where any crates are completed remove them, inserting a fresh set in place of each. If foundation has to be used let that go next above the brood frames; and combed sections if on hand are to be placed above those already on the hive.

The Super-Space should be Reduced

towards the end of the season; and this is done by gradually removing completed sections, and finally closing up with the dummy. The open spaces thus left above the frames may be stopped by strips of wood or carpet. This plan is preferable to adding further sections, and the almost certainty of a great number being left incomplete.

An additional advantage is secured by this process of contraction as the season is closing. The bees are compelled to "crowd" on all the remaining comb space, and it does not appear to be generally known that while under this condition a far greater number of sections will be completed by the bees using honey carried up from the stock combs, even after gathering has actually ceased.

Swarming Late to Finish Sections.

Now, is it worth while taking a little trouble when you know your last honey flow is nearing its close? Then try this plan.

Instead of reducing the brood space or combs, move the whole lot away to one side in another hive. Fill up the original hive with frames having ½in. guides (starters) only.

Return the queen, when the bees about the sides of the hive, and the large number returning will make a good swarm. A full size stock chamber is as good as a shallow one for this purpose. After 24 hours replace the sections you require to be completed, above this swarm. Being late the bees will not build much below, but they finish perfectly the section combs above, as the fresh start under the swarming impulse has excited them just enough to make them secrete more wax for comb building than they would otherwise do towards the end of the honey season.

Considerable judgment is required as to whether a fresh set of sections is to be added above those being finished ; but certainly after the first are completed and removed, one may start another set, if only that drawn combs may be secured for the following year.

The original combs will be covered by young bees meantime, and will have a young queen laying (or one supplied), which will take the place of the old one, when the two lots may be re-united.

Feeding Back to Complete Sections

over these improvised swarms will be found far better than the attempts that have hitherto been made to feed back extracted honey to normal stocks in the hope that unfinished sections may thus be completed. With colonies retaining the whole of their stock combs (or any of them) there has always been too much waste to allow of the operator seeing any profit on the process as generally attempted. By the adoption of this plan of swarming on starters at the close of the season, the feeding back of extracted honey to complete comb-honey will be found eminently satisfactory if a little water is added to the honey when very thick or quite ripe.

The used-up bees

may or may not be worth re-uniting with the stock and young queen ; but that will depend largely upon the locality and condition of the apiary. In any case these old bees would not be greatly missed by the original stock.

Remove Sections

during the working hours of the day, when a few puffs of smoke will generally send all the bees below. If this fails use the carbolic cloth. With the Double and Treble Conqueror hives the sections can be removed free from bees a few hours after the stronger force has been turned back.

Grading and Bleaching.

When brought indoors every comb must be looked over, while at the same time all propolis or other stains are to be scraped off from the wood, taking care not to injure the face of the combs. All the whitest and best finished are to be first selected and stored in crates piled one over the other, with ventilation right through the whole tier.

The next in order are those which, while being well finished, are not of such good colour. These are to be piled up fully exposed to the light and air for a time, when the colour will be equal to the first with which they may then be classed. If placed in crates for bleaching, the latter must stand singly or on end, so that the light may penetrate. A piece of straining cloth or wire netting should take the place of the usual lid meanwhile, that there may be a free circulation of air, and no fear of mice or flies soiling the combs.

This question of bleaching comb-honey was first given to the bee-keeping world in my pamphlet of 1886, and

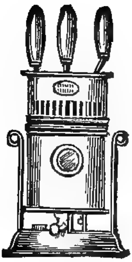


FIG. 45.

Meadow's Heater for Uncapping Knives.

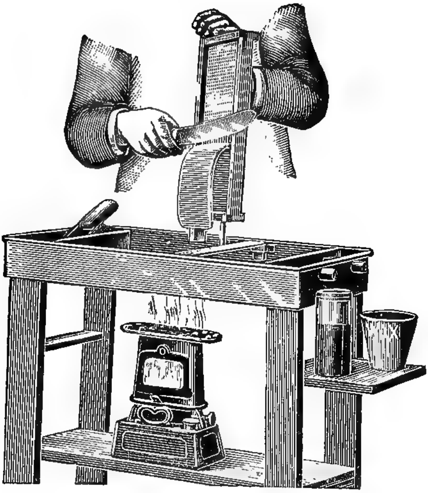


FIG. 46.

Meadow's (Gray's) Complete Uncapping Stand and Capping Melter.

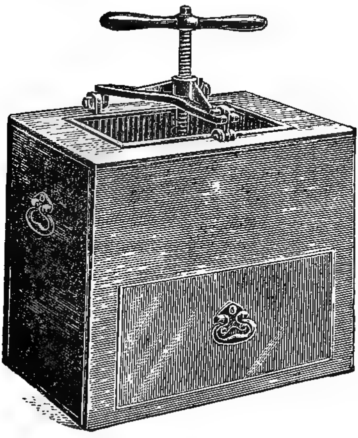
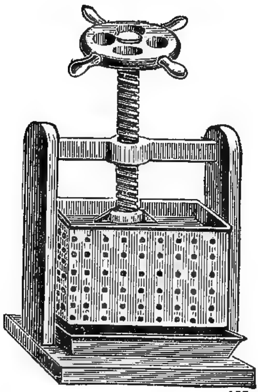


FIG. 47.

Meadow's (Rymer) Honey Press, for extracting Heather and other thick Honey.



157

FIG. 48.

Meadow's Honey and Fruit Press.

in recent years the subject has received more attention, especially among American bee-keepers, some of whom think sulphur should be used; but this is not necessary unless there is any fear of wax-moths developing. Light and air quickly alter the appearance of comb-honey, giving it the shade of comb rapidly filled with sugar syrup.

From my Non-Swarming pamphlet (1886), page 16, we find this about improving sections of honey :—" The " appearance of comb-honey is immensely improved after " removal from the hive by being exposed to the air, and " a woven wire screen should be arranged for that purpose " in some light dry room, free from dust. I need hardly " state that no honey should be placed in the direct rays " of the sun."

Those constituting the second grade will be all that are not nicely finished, though there must not be too many incomplete cells. Those that are a little discolored can be restored as before. Any that cannot come in as second-rate may have their contents extracted and the combs stored for future use; first making sure that no moisture hangs about them by placing a number over any strong stock towards evening, when the bees will soon clean them. (See also " Feeding Back " to complete.)

The Store Room

should be perfectly dry, thoroughly ventilated, having a concrete floor, and all so carefully arranged that neither mice, bees, nor other insects can gain admission. (For further particulars see Bee-houses, &c.)

Preparing for Market.

Crates can be made to hold anything from one to three dozen, the latter being mostly required. It is imperative that there be glass on each side parallel with the face of the combs, not only to make the package more attractive,

but as the greatest safeguard against rough handling. As an additional protection against friction, the sides and bottoms should be lined with patent corrugated paper, when there will be little fear of breakages.

Cushioned Comb-Honey Crates, for Rail or Shipping.

The best form of comb-honey crate is that illustrated at Fig. 54. A similar "shipping" crate has recently been adopted by the proprietor of *Gleanings in Bee Culture*, but with only one thickness of corrugated paper at the bottom, none at the sides or top.

The editor of that paper, in the fulness of his joy at having discovered a good thing, exclaimed, "Why did not somebody think of it before?" Well, somebody had thought of it, and had adopted it in a more perfect form more than 20 years earlier; thus, in *Simmins' Non-Swarming System*, p. 39, 1886:—

"For a perfect travelling case, which can always be "ready to travel any distance, the bottom should be lined "with *double thickness* of patent corrugated paper, and *the* "*sides*, where is no glass, one thickness of paper, with the "ribbed side next the sections. Should any leakage occur "the recesses in the corrugated paper hold it, while the "sections ride high and dry. No better cushion could be "designed to prevent friction or jarring, and with the glass "left uncovered, so as to expose the honey-comb to view, "no other packing is needed."

The Perfect "Shipping" Crate

therefore has a double-lined bottom, with the corrugations of the two pieces at right angles, while the sides are single. Another piece of safety paper is provided to place *over* the sections before securing the lid. The paper for the sides and bottom is in one piece, creased along the angle where

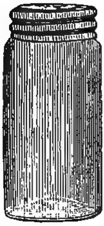


Fig. 49.

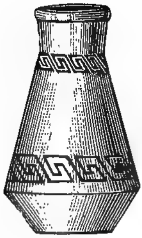


Fig. 50.

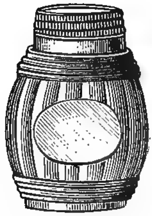


Fig. 51.

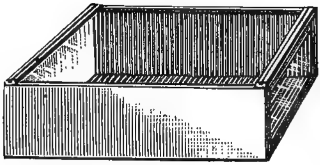


Fig. 54.

Comb Honey Crate, with Corrugated Lining or Cushions. Also Fig. 54a.

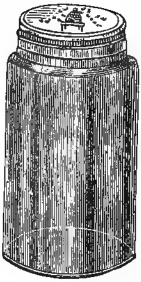


Fig. 52.

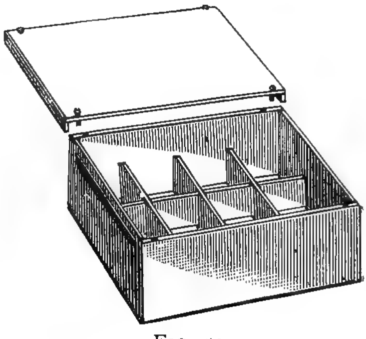


Fig. 53.

Bottle Crate for one dozen.

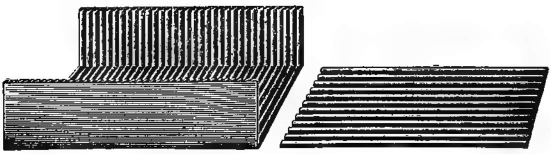


Fig. 54a.—Corrugated Lining for Crate (Fig. 54).

turned up, thus always remaining in place. The bottom and upper single pieces lie with the ribs across the sections.

Though more expensive, the crate may be placed on a false bottom with coiled springs, of a power necessary to resist the weight that is to be placed above.

Sections should be enclosed in clean white paper, pasted securely where overlapping, when, if any breakage does occur, the contents of the damaged one will not escape and spoil others.

The above should be done with each section, whether fancy boxes are used or not, but while the latter additional expense may do if retailed at home, it will certainly not pay at wholesale. I have obtained as much for sections without as others were getting with fancy boxes, in the same town; one should therefore be careful before adding this expense to his commodity.

Fancy section holders have been used largely, and will no doubt be more appreciated in the future. They are made of tin, folding somewhat like the American section, and will be found very durable, as, if soiled, they can be readily cleaned. They can be had in several colors, and though expensive in the first instance, that is not a very serious consideration, seeing they can be used many times without injury.

The Sale of Honey.

Where the apiarist retails his honey, of course he will always have his own label on it; something as neat and attractive as possible. It is surprising what a number of bee-keepers there are who will send from 100 to 500 lbs. of honey to a distant town at a very much lower rate than could be obtained at retail near home, if only a little perseverance were used. This shows a great want of

business tact, in thus depriving themselves and injuring producers at large by reducing the value of their crop.

In securing some efficient tradesman to handle honey, where one has a large quantity, some difficulty will be experienced at times, as there are many who will not put it forward. If a grocer himself owns bees, *his* honey is very soon passed over the counter; and why not that of others where the grocer is not following the pursuit? Perhaps the fault is with the price, but, nevertheless, being a comparatively new article, the retailer must be induced to take a lively interest in it. Make it attractive by providing a good show case and cards; and let him have a consignment "on sale or return" to start with, and there is no doubt he will soon send for more. Do not attempt to send any without complete protection from flies, &c., as this is one of the most frequent objections made against having it in stock.

Exhibiting Bees in Shop Window.

From time to time comes the same old tale:—"How or where can I sell my honey?" And yet there are hundreds of bee-keepers who not only sell all they get without any difficulty, but have repeated calls for more.

One of my earliest designs in show-cards was to send the grocer in a large town an observatory hive, with stores, brood, and a nice yellow queen with the bees; exchanging the same as often as the brightness of the exhibit began to wear off. This item was first given in "A Modern Bee-Farm," 1888 edition, but the process, however, is an expensive one to keep up. Almost any producer with a few hundred pounds for disposal could afford to make a "start off" with just one exhibit, getting the grocer to make room for a nice glass case of comb and extracted honey on either side.

Country Fairs.

I have often wondered why those who are troubled about selling their honey do not make some effort to dispose of it at the combined cattle and pleasure fairs so often held about the country. I know from experience that if only shown on such days there are to be found numerous buyers, who have not hitherto used honey simply because they did not know where it was to be obtained. Stick on your name and address, and if possible, distribute honey leaflets by the hundred, and soon you will be wanting to lay out for a much larger "output."

Fruit and Vegetable Markets.

I wonder how many of my readers are still in bed and asleep, while an immense business is being done in the early morning markets of large towns? Probably not one in a hundred is astir, and yet what a number of likely purchasers of honey the early riser might find if he were only there with his commodity all ready for convenient handling!

Commission Agents.

Here is an opportunity for those who still say they have no chance of disposing of their crop. Why not try some one of the many fruit and vegetable salesmen in the central markets? There are many reliable business men among these, of long standing, who, doubtless, would be only too pleased to handle honey if put up in a convenient form. There is no delay, and back comes your cheque by return of post.

I came across a genuine cottage honey producer the other day, and said he: "I was talking to a gentleman one "day, and he says, 'How about bees, do you sell any "'honey?' 'Oh, yes,' I said, 'there is no trouble about

" 'that.' 'Well, send me some, and I will see what I " 'can do with it.' So I did, as I found he was a selling " agent, or whatever you may call him, and he got me a " very fair price, too, and is always ready for more. But " other people I have usually supplied are already speaking " for my crop that's yet to come."

This is as it should be, where a man keeps steadily on and works away with a will. There are many ways and means yet for the disposal of honey, if the producer will carefully look about, without depending upon his County Association to do the work for him.

For Exhibition

combs must be visible on both sides, using for the purpose only those sections of the very best color and finish. In some quarters it has been considered that the comb should not be sealed close to the wood all round, but this is a serious error, the idea being that the section can be more easily cut out; but I have yet to find the retailer who does not prefer those for his window which are sealed perfectly all round the edges; and when one of each may be placed on the scale, is there a doubt as to which the customer would select? Moreover, those that are filled up to the wood will stand the risk of transit far better than would otherwise be the case. Fig. 92 shows Abbott's comb-honey exhibition crate.

Producing a Surplus.

How many hundreds of bee-keepers are there who are not bee-masters, and who seem unable to do at the right time the correct thing, and to carry out that comprehensive management which alone will give a large and profitable surplus?

One man will produce honey by the 100 lbs. to each stock and more, while at the same time some of his

neighbors get their twenties, their tens, and their noughts. I give the reader an instance of a cottager who secured an average of 72 lbs. of section honey from his eleven hives during the unfortunate season of 1902, with no unusual crop near him, while other bee-keepers near secured twenty-one sections from one bar-frame, and nothing from another. Another had 110 lbs. from three frame hives; while among straw skeps, few had sufficient store for winter.

Young Queens ; No Swarming ; Large Profits.

My non-swarming system as relating to the management of the Conqueror Hive; and my original methods of controlling swarming are all set out in conjunction with the great corner stone of practical procedure—the production of young queens yearly, to take the place of the older queens at exactly the right time for ensuring the highest results according to the operation in hand.

I have already demonstrated that the Conqueror Hive is the nearest approach to perfection in the economic restriction of swarming, but it is not to be supposed that there ends all need of care on the part of the owner. For instance, if he will make a nucleus in early Spring, and rear a young queen, she can be given to the stock while the older queen will build up the nucleus to a stock, to be united to the full hive after the season is over; while, in the meantime, the presence of the young queen avoids swarming, and prevents the excessive production of drone combs.*

Then, as regards "Combined Swarming and Doubling" without increase; a young queen is given to the united swarm, so that further swarming may be avoided, and

* Even with all worker foundation supplied, the bees will replace patches by drone cells at times.

worker combs produced, ensuring the maintenance of a large working population.

Again, in simple "swarming without increase"; as soon as the young queen with the old stock combs is well at work, the swarm and stock are re-united with the young queen presiding. The older queen may be destroyed or given a small nucleus to build up for further uniting at the end of the season.

The Cause of Low Averages

is the want of initiative—the absence of definite action, by the average bee-keeper. He is content to take things as he finds them, supering each stock in rotation as he thinks it becomes strong enough. There is often no thought of doubling or of rearing young queens in nuclei from his best stock; that they may be united to the colonies at the right moment.

Weak or backward stocks, instead of standing all the season, probably with a poor queen, doing little or nothing, should be used as nuclei with young queens, each standing by a stock to which it can be united in Autumn, or just before the heather harvest where it occurs. This question of young queens and doubling or uniting is so important that it would bear repetition on every page, and yet not be out of place.

The hive, of course, has much to do with the yield, but even improved hive construction is of little avail if its benefits are not supplemented by the works of

The Man of Grit.

The cottager mentioned secured 120 lbs. from the Conqueror Hive, all in sections well filled, while his other best hives gave about 80 lbs. each. In another instance, an Irish bee-keeper secured 208 well-filled sections from a Conqueror stock and its first swarm, the issue of which

being a reminder that he had been too busy to attend to their wants.

Mr. Wells' report shows an average of 66 lbs., nearly all extracted; but this is often largely exceeded by the more simple single hives; and Mr. Cowan's report of some years since, though also extracted, shows a higher average; his yield from seven hives being 1,360 lbs., or 194 lbs. per hive. In 1874 the latter gentleman also secured 907 lbs. from twelve hives, of which 707 lbs. were comb-honey, an average of 75½ lbs. per colony. These are profitable returns, certainly, but by no means so high as the reader should set himself to accomplish.

Pure Oxygen *versus* Disease.—The time has come when bee-keepers dare no longer neglect this important question of efficient ventilation.

Bee-Paralysis can be checked, and in many cases cured by unusual, but systematic, ventilation ; while on the other hand this disease is greatly encouraged by the universal neglect of this First Principle in Bee-Management. The complaint continues to-day largely because of this deplorable neglect, and the want of initiative among all classes of bee-owners.

CHAPTER XIX.

THE HANGING CHAMBER HIVE.

SCIENTIFIC VENTILATION *versus* DISEASE.

WHILE the Plague was not, and bee-keepers slept the Sleep of Folly, in ignorance of the rolling stone that had started down the mountain-side to crush them, slipshod methods of ventilation seemed not so much to matter.

The enemy was as yet inactive, unknown,* unthought of. Cramped entrances and unsuitable hives mattered little, for did not the bees themselves ventilate for all they were worth when fresh air was necessary? But I assure the Reader they do not, as many owners now have found to their cost.

* The majority of British bee-keepers were totally unprepared for the visitation of infectious paralysis that spread over the land from the year 1904, although it had been known for many years in America, Australia, and other countries. The Author had a severe experience of this malady in 1878, but was able to effect a permanent cure with no loss of stock.

Not only are the bees unable to force a sufficient supply of pure air into the average hive when very populous, and the weather is hot, by the usual openings allowed ; but in cool seasons, when ventilation is also much needed, they do not ventilate at all.

Hence the utmost necessity of using a hive that is ventilated fully and freely at all times, without inconvenience to the inmates ; and in such a manner that no perforated zinc is required, and therefore the air spaces (as bee-spaces) are never closed up.

Few disease germs can exist in the presence of a plentiful supply of pure oxygen, as it helps to build up the vital properties of healthy tissue, while at the same time consuming waste matter, thus expelling or destroying all harmful parasites, which, like vultures scanning the plains from afar, and yet ever near, are ready to swoop down upon their prey the moment the light of life is overshadowed.

Unusual Ventilation.

I am compelled to use the term "unusual," as that is really the condition that is required, and if it is not so explained, the average Reader will not realize that he must provide more fresh air than the ordinary hive allows, if he is going to keep free from disease in the future.

In the Conqueror hives the quilting is tucked down to the front and two sides close against the outer case, *but the space up the back* ($1\frac{3}{4}$in.) *is never so closed*, hence there is always a free passage of air under the stock, *but not through it.* The outer entrance in Summer is some 2in. deep by 16in., but may be considerably reduced for Winter, because of the perfect internal ventilation.

The $\frac{3}{8}$in. space between all chambers and the front wall of the outer case permits of the majority of the honey

gatherers entering directly into the supers without passing through the brood nest.

Increased Yields of Comb-Honey.

When one has made up his mind to start with nothing but drawn comb, he will find it can be done, and an immensely increased yield will be secured thereby. The difference between using foundation and drawn, or partly worked foundation, in sectional supers will often represent some 30 lbs. in favor of the latter, as the bees store all their surplus above from the first.

In an apiary where other stocks were yielding 60 lbs. to 80 lbs. each, one worked with drawn combs as above gave 120 lbs. It will therefore be seen that Simmins' Non-Swarming plan, really a carefully organized and definite system, was founded upon the fact that *Drawn Combs* in sections, expressly prepared each season for that purpose, would *ensure* bees working therein, while all the time a large space existed below the stock hive.

Bee-keepers generally have saved over unfinished combs in sections from year to year, and these were found to give a good start to the bees; but nothing was ever done to institute the systematic production of such new combs for all sections before being placed in position, until the Author's system was published in 1886, as a result of several years' previous development.

No Waiting for Full Depth Cells.

It is a mistake to suppose that the foundation will in the first instance be drawn out to fully extended cells. Nothing but disappointment and loss of time will result with such an object in view. A day or two only should be allowed before the partly worked comb is removed and further sheets supplied for the same purpose.

The line of halved (2-in.) sections, or the line of narrow

THE AUTHOR'S DOUBLE AND TREBLE CONQUEROR HIVES, AND "TURNOVER" METHODS.

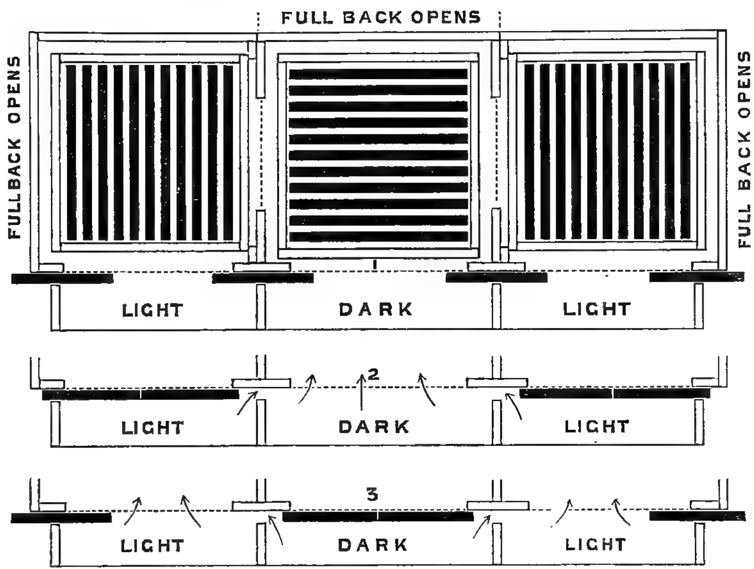


FIG. 55.

Ground Plan of the Treble Hive. (1) Direct openings to each compartment. (2) The working force all turned to the centre. (3) The two outer stocks reinforced by closing the centre.

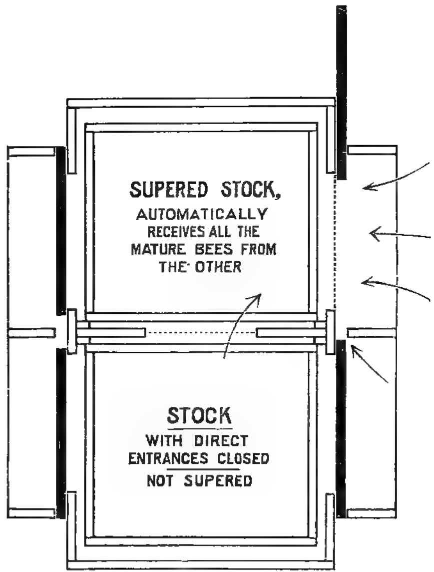


FIG. 56.

Plan of the Double Conqueror.—The whole working force of two stocks being turned over to one. For treatment of denuded stock see p. 310.

three-side-cut ($1\frac{1}{2}$-in.) sections may be started between brood frames, leaving each set only 24 hours; but if one has a good locality and favorable weather he may take some risks by starting with all foundation, and get four or five supers partly drawn, over each stock by the following method of

Rapid and Wholesale Comb Preparation.

The process is somewhat difficult to follow with common semi-fixed chambers, the use of which largely discount the advantages of some of the valuable processes herein described, and prevent many from realizing the great value of the Author's hanging chambers.

With these, all hanging an exact bee-space apart (bare $\frac{1}{4}$in.) the stock may be started comb building just as the season opens, with one super below and one above. Within three days one or both will be occupied, and the foundation already well drawn. A third super is then placed next above the stock, and in another day or so a fourth may take the place of that below. This last may again be exchanged for another as soon as the foundation is well drawn; and the process continued below while the three above are being filled and sealed; when the several drawn sets secured earlier will be exchanged for those completed above the stock.

Prevention of Swarming.

In connection with the large entrance (2in. deep), and the stock being raised some inches from the floor, this method presents the best means of prevention, while at the same time ensuring the largest yield of comb-honey, the bees never having finished combs below the stock chamber. In due course the stock is moved down next the floor (not touching it), with the final supers above only.

The Double Conqueror

was introduced by the Author in 1894, and unlike the Well's hive, the chambers are quite distinct, being simply the Author's usual hanging eleven-frame chambers, and the non-swarming chamber (a super started) under each. In fact it is arranged as two single Conquerors back to back, having an excluder zinc passage-way between, which may be opened or closed at will.

The Management

of the Double and Treble Conquerors is quite simple, and heavy yields are secured from them. Swarming, Dividing or Uniting (or the removal of bees from finished supers) may be carried out merely by shifting one of the slides, which results in "Turning Over" or "Turning Back" the whole of the working force of one side to the other as desired, while the bees hardly know the difference.

On page 242 of my 1893 edition of this work will be found formulated the first definite and workable system of using two stocks (or one stock and its swarm) in combination. Other plans since offered all fall short of the simplicity of the Conqueror Double and Treble hives, which require no alteration in construction for developing any number of combinations or divisions.

The "Turnover," with Two Stocks.

The Double Conqueror has two entrances to each stock (therefore two at the back and two at the front). Consequently when the two stocks are strong enough one is supered, while the other has its entrance closed. This throws all the actual workers into the one supered hive, while the queen of the denuded stock fills up rapidly with brood, having few gatherers to clog the cells with honey.

When thus "turning over" the middle excluder partition

THE DOUBLE CONQUEROR HIVE AND METHOD OF "TURNOVER."

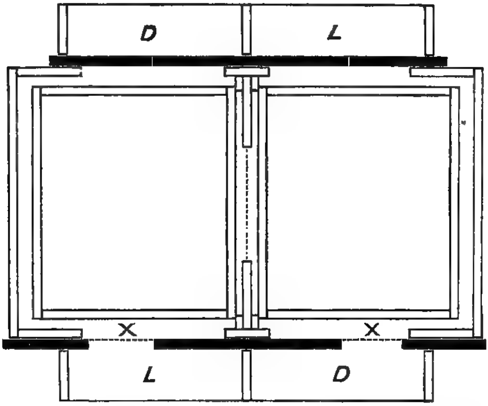


FIG. 57.—The two entrances shown open on the same side; but one may be open at the back. The excluder passage-way in the dividing panel is shown by dotted lines between the Stock Chambers.

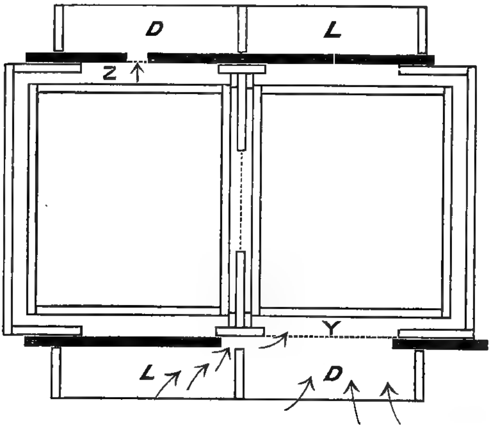


FIG. 58.—The two forces united by moving the slide as before; but with the back entrance slightly opened the same day. As an alternative the front entrance (at first closed) may be opened half an inch after three days. The dark lines represent the entrance slides. Letter D, painted dark; L, painted a light colour; thus preventing the workers mistaking their own entrance when working from the same side.

is opened, and is left open all the season, no matter how many times the bees may be turned over or turned back.

The denuded side is not left with its doorway (entrance-slides) quite closed; but three days after the "turnover" the same entrance may be opened half-an-inch. Otherwise instead of this opening on the other side, the back way may be opened slightly the same day that the turnover is made.

A Single Stock

may be worked in a similar manner, first making an early nucleus from the stock and placing it in the other side; using the young queen when in full work for producing the surplus population for its parent hive; or the process may be reversed, using the nucleus when ready as the supering hive. In this case the brood combs may be first made up from the stock.

Stock and Swarm.

A swarm may also be hived in one side for carrying out the same process of helping a stock in the other; or the stock itself may be swarmed early and presently worked in combination. Lastly two swarms may be used for stocking the Double Conqueror, and presently helping each other upon the same plan.

The lot that is "turned over" must never be quite shut in. Of course it always has a way out through the excluder partition and the other stock; but where the back entrance is not slightly opened on the day of the "turn-over," they may have their former entrance opened half-an-inch only on the third day thereafter, as then the recently united forces will be using, and will continue to use, the full width entrance of the supered lot, until they may again be "turned over."

The Treble Hive.

This is worked very much in the same way, but of course allows of a more powerful combination. Indeed nearly all the methods advocated under general management, having reference to "Swarming without Increase" with both single and double stocks, can be more readily and profitably conducted under the one cover, and simply by just moving the ordinary entrance slides.

Immediate Feeding Important.

Stocks that are depleted of the majority of their adult bees should be fed while the weather may be unfavorable. For this purpose there is nothing so useful as a large frame of candy.

Let me repeat that the entrance of the depleted stock must be re-opened to ½in. by the third day after the operation, on the same side, or on the opposite side (of the same stock) the same day.

Ventilation by Raising Stock from Floor.

I have repeatedly advised many correspondents to raise the stock chambers of ordinary hives with blocks under the four corners. Many producers of honey raise the front on deep blocks, thus exposing three sides; while others push the stock forward some inches beyond the floor edge during a heavy flow.

Why Swarming is Checked.

These old plans, much neglected by the younger generation of bee-keepers, certainly check swarming, for the reason that the bees discontinue brood-rearing along the lower margins of the exposed combs; while the extra ventilation is beneficial, and helps to avoid disease.

The Queen-Mother of a colony of bees should be the life and soul of the hive. A reliable, highly prolific queen, reared from a strain possessing the most desirable characteristics in relation to honey gathering; as also white and otherwise perfect sealing; eager and rapid comb-building; as well as that invaluable trait—longevity—ensures the highest possible results where the energies of the workers are intelligently directed.

CHAPTER XX.

QUEEN REARING

BY NATURAL, IMPROVISED AND SCIENTIFIC MEANS.

IT is generally understood that when a colony is deprived of its queen the bees are soon aware of the loss, and forthwith special cells are constructed upon larvæ that may be from one to three or four days old, but very seldom are *eggs* selected in such a case of emergency. In due time a queen is hatched from one of such cells, and though she may have enjoyed the usual quantity of royal jelly, it frequently happens that the first to emerge from her cradle is one that is not well developed, as the older larvæ would naturally come first to maturity. Thus those which had been selected from the egg, or one or two days after hatching therefrom, and would have received only the royal food from the first day of their existence, and consequently are destined to be perfect in formation, are frequently sacrificed to a dwarfed and ill-formed queen.

A Surplus of Milky Food not Scientific.

In the case of artificial rearing of queens, several writers have insisted upon the necessity of providing the transferred larvæ with a double dose of the milky food found in the worker cells.

But in transferring larvæ for this purpose we want to make sure of rearing real queens—the very best of queens; and certainly nothing approaching neuters. Therefore why add more than is absolutely necessary of that food which has been prepared for the development of the stunted worker?

Can we be quite sure the workers do not remove the bulk of that undesirable food one may take so much trouble in adding? Anyway it is an act to be avoided.

The Author has, in the past, started queen cell cups with common larvæ, and after a few hours the grubs have been removed and replaced by selected larvæ. No advantage could be detected over the plan of starting in the first instance with those desired.

Foster-bees and Queen Rearing.

It is not generally realized that the workers selected for rearing queens may to a large extent transmit their own peculiarities to the workers of those queens to whom the former have acted as foster-mothers.

Hence the great necessity of using vigorous bees for this purpose; while those possessing any disagreeable habits should be rejected. The Author has also made a practice of using workers for rearing that are unrelated to the queens being produced.

As already shown, in the case of emergency queens only one is reserved, though several may be raised. There are two points, therefore, of importance to the bee-keeper who wishes to obtain a number of superior queens. The colony

that is to produce them must either be made queenless, or be maintained at a swarming condition ; while another plan is that which divides a strong colony, using the queenless swarm for starting the queen cells, and then he is to guard against the destruction of the surplus queens.

The Plan often Recommended

of simply removing the queen from a colony in normal condition and then inducing the bees to start queen cells where desired by enlarging the mouth of worker cells, is really more simple than practical. In the first place, one cell only is never large enough to form the base of a queen cell ; two at least are thrown into one, but more often three ; and where the bees have unlimited material at hand a queen cell will not be built upon one in fifty of such enlarged cells, and where Ligurians are concerned very often only two or three cells are started.

My own Plans

vary according to the condition of the hive under treatment and the season of the year. Thus, early and late in the season it is better to provide, or leave part of a comb in the frame, upon which to attach the cells containing the selected larvæ for queen-rearing. During settled bee-weather, the plain bars across the frame may be used for the purpose, or my original revolving bars and cell-cups attached, for greater convenience.

The bars with cell-cups may be inverted so that the flat sides may be used also for attaching the single worker cells without removing the egg or larvæ.

My Methods of Preparing Stocks

for queen-rearing consist, early in the year, of removing the queen one day, and the next day shaking off all the bees

from the combs of brood, which latter are then removed, and the prepared comb of selected eggs inserted.

By the time the prepared comb is ready the broodless and queenless bees will have found out their loss, and being greatly excited are in the best condition possible for starting queen cells. Place a comb or two of stores at each side, and after two or three days add combs of hatching brood to keep up a population of young bees.

Another Method

frequently adopted with great success in my own apiary is that of selecting combs heavily charged with brood on the point of hatching with all the adhering bees—using one from each of three or four good colonies, taking care not to remove either queen. Place these combs in a new hive which for convenience should have been carried round in collecting them, and after a few hours, or next day, insert the prepared comb of just hatching larvæ near to the centre. The young bees just congregated (of course, well provided with stored combs of *unsealed* honey and pollen) will produce some of the finest queens ever seen. Remove all queen cells that may be started on others than the prepared frame and add other combs of brood just being capped, so that later on as many good nuclei as possible may be made up from these stocks.

Or the same collection of young bees and brood may be placed in the cellar for two days, and the prepared cells given the third evening, when setting them out on a new stand.

Queen Rearing under the Swarming Impulse

is a plan that should not be adopted, though frequently recommended. The bee-keeper should do all he can to avoid rearing queens under the swarming impulse. Moreover, stocks kept up to this state are a great annoyance to

the queen-rearer in various ways. They are, of course, not available early and late, but when in season will always be building comb where it is not wanted, and making everything sticky with honey when these combs must constantly be broken. These and other difficulties are not so much in evidence when all young bees are used for queen-rearing, while the cells are equally as fine, and the queens certainly more desirable.

Queen-cells without Removing the Presiding Queen.

It is not generally known that at certain periods of the year one may ensure the building of fine queen-cells in the hive where the original queen is laying all the time, and no zinc excluding divider need be used ; in this case not under the swarming impulse, but at the season swarming is quite out of the question.

Towards the Autumn a full sheet of foundation may be used to divide the brood-nest. As soon as this is partly worked about the centre and there occupied by eggs, a fresh sheet of foundation takes its place, while that with eggs is placed between brood-combs on that side of the plain sheet where the queen is not. She will rarely pass the latter at this season, and a number of fine cells are built on that sheet first inserted.

Instead of inserting the second sheet of foundation, the queen may be removed just as the eggs are hatching in the new comb. Fine queens may thus be secured at a season when other methods will largely fail, although the weather may still be quite suitable for mating.

Retaining the Original Queen in Summer.

The above plan represents the principle upon which a very simple method of queen-rearing can be carried out during the active season, without the least necessity of maintaining a stock at the swarming point. A moderately

strong colony may be divided by an excluder dummy, and as soon as the queenless portion makes preparation for building queen-cells, the selected eggs or larvæ may be given them for rearing the desired queens. Those first started are at the same time destroyed, or the combs removed.

Quadruple Nucleus and Queen-rearing Hive.

This method of queen-rearing can be carried out with an average colony during the whole season, by using a long hive capable of being divided into four compartments, and having four entrance ways.

The original position of the stock is shown by the illustration No. 1. The first development finds the stock divided as No. 2, with the queen-rearing compartment at the right (A) taking a portion of the combs, while the stock has foundation given to replace them.

The original entrance at *e* is retained; while the stock throughout the further developments is allowed the use of the entrance at the back as it is moved to the rear.

The first, second, and third nucleus queen-rearing lots as developed, retain the one entrance at *e* only, as common to all; unless, or until, either may be allowed to retain a queen of its own.

The second development (No. 3) finds at B a further queen-rearing nucleus pushing A further back.

The third development shows that both A and B are moved back to make room for C, No. 4.

Soon after this A will have its cells ready to be removed, when those in B may be transferred to A; those in C to B, leaving C to start again.

These developments, of course, imply that a large number of cells are wanted; but the process can be modified to suit the requirements of the owner.

METHOD OF REARING SUCCESSIVE BATCHES OF QUEEN-CELLS, WHILE LEAVING THE FERTILE QUEEN.

No. 1.

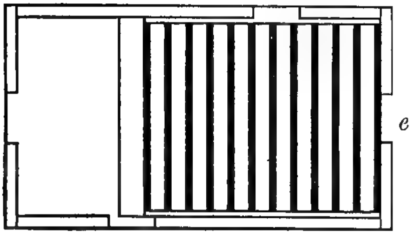


FIG. 59.—Original Stock with entrance at *e*.

NOTE.—The wide blank spaces are dividing dummies with excluder zinc on each side.

No. 2.

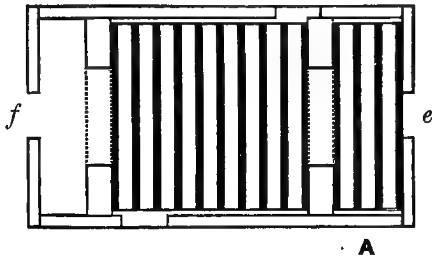


FIG. 60.—First development with Queen-rearing nucleus **A** between stock and entrance.

No. 3.

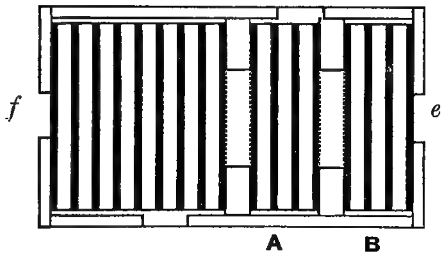


FIG. 61.—Second development with nucleus **B** next the entrance. The entrance at *f* also open.

No. 4.

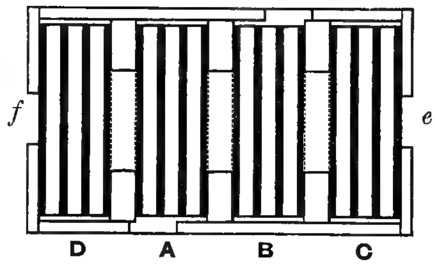


FIG. 62.—Third development with nucleus **C** next the entrance. The entrance at *f* also open.

A fourth development would be the removal of the cells in **A**, starting **C** with a fresh set as the others are moved back. Otherwise the queen at **D** may be started elsewhere.

Finally the portion with the original queen may be used to start a fresh stock, leaving the four compartments to accommodate nuclei with young queens.

The Dividing Dummies

are fitted with *double* queen excluders, and with these dummies the nuclei not only feel more secluded from the original stock; but in the event of young queens being allowed in each, they may be left longer than can be the case with single excluders, a feature hitherto overlooked.

The Author has had queens mated on either side of such excluder dummies for a period dating back prior to 1890; the bees mixing indiscriminately; and therefore he can fully recommend the plan to his readers.

Combs in Queen-rearing Frames.

Except during the early and late manipulations, I find the queen-rearing frame with detachable cells is much better if worked without any comb being allowed in the same frame.

The honey stored in these small combs is always in the way; but I frequently work the cell-frames with foundation in frames on either side, or a full sheet of foundation between two cell-frames. It is a great saving of time and material in working,

Two Cell-frames in one Colony

or in the successive divisions of one colony, sometimes securing 30 to 40 fine queen-cells in one batch. Thus the three or four divisions of a colony as just illustrated may be carrying something like 100 queen-cells at one time.

Several Ways of Starting the Queen-cells.

The new worker combs containing the larvæ just hatched from the eggs may be sliced crosswise as shown in Fig. 63,

so that at least one whole cell is left in each ; these are then attached to the lower edge of a comb reduced to a semi-circular form ; to plain bars across the frame ; or to the Author's removable cell bases when these are inverted ; the attachments being made in a vertical manner by melting the wax on the then upper side of the base. All is done in a warm room, and the frame carried quickly to the desired stock.

Having experimented with artificial cell-cups since 1881, I must say that by the above plan, using worker cells, the bees can produce the queen cups upon them far more economically than the bee-master. In 1894 I carried out a series of experiments with drone cells attached to my bars and removable pegs, transferring the larvæ thereto.

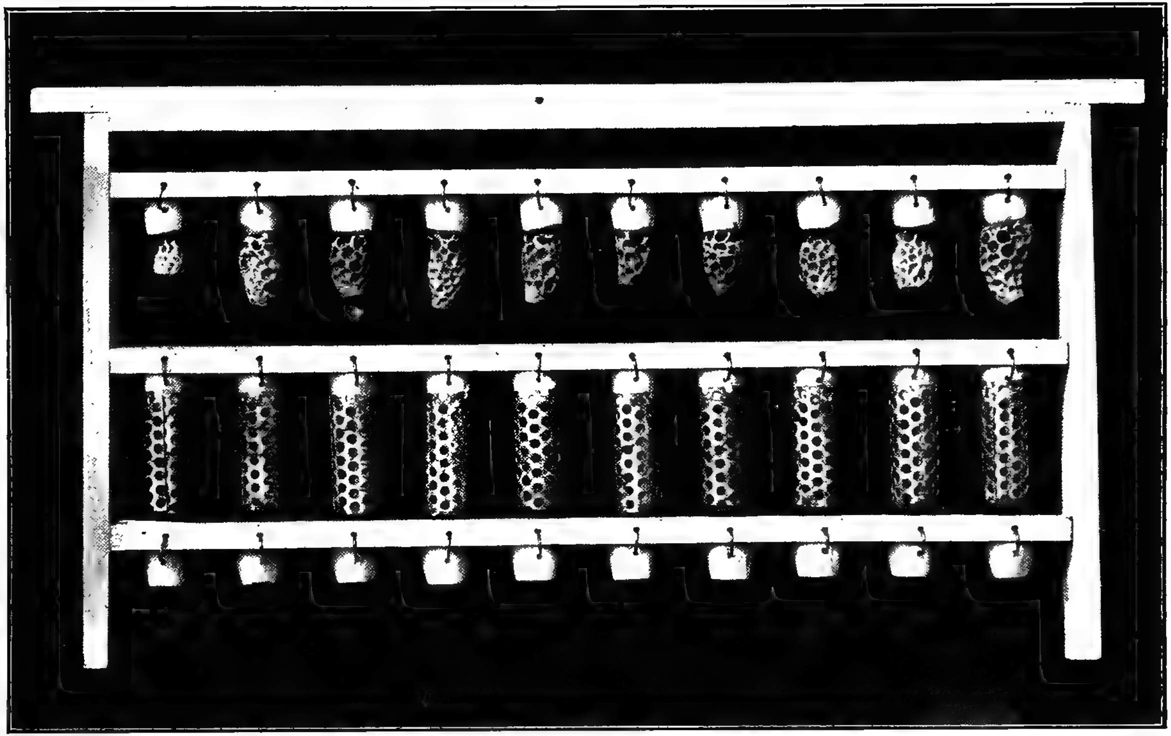
Drone Cells for Queen-Rearing.

The experiments with drone cells as the bases of queen-cells were carried out with the Author's original and separately movable cell bases in 1894, and any queen-cell could be removed without detaching it from its base.

New clean drone comb is selected, and cut into single cells when used for attaching to bars or the flat inverted ends of the movable cups ; or strips may be used and fastened to the lower edge of a shortened comb. In the latter case the larvæ selected are transferred to each other cell.

Origin of Detachable Cell-cups.

The earliest movable cells used by the Author are illustrated opposite page 311, from a photograph taken in 1894. This photograph, showing the method of securing the young queens as they hatch, was sent to the Editor of *Gleanings in Bee Culture* during the same year, but he did not appear to realize the advantages offered by detachable cell bases ; for in the same journal for September 15th,



From a Photo] [*by Mr. J. W. Clapperton, Galashiels*, 1894.

SIMMINS' QUEEN-REARING FRAME,

With his Original Detachable Cell-Bases, and his (1887) Tubular Cages for confining the cells or hatching queens.

1903, he described and illustrated an almost identical queen-rearing frame, with the very same perforated tubular cages, as an invention recently patented by one named Stanley.

From this date *Gleanings* and other journals at last awakened to the advantages of detachable artificial cell-cups.

Economic Construction of Wooden Cups.

If the artificial cups are made too deep, or the wood is at all too thick, the embryo queen will take longer than the usual period to develop, through the loss of the necessary "contact warmth."

Hence the necessity of having the artificial cups as shallow as possible, say not more than $\frac{1}{4}$in. deep, by $\frac{3}{8}$in. in diameter internally, and $\frac{5}{8}$in. externally.

Natural Based Cells—No Melted Wax.

The frame is placed flat on a table with the revolving bars turned half round, thus bringing the line of wooden cups with the openings uppermost. Circular discs of brood foundation are first prepared by cutters in two sizes $\frac{5}{8}$in. and $\frac{1}{2}$in. in diameter. The smaller disc is first placed in a cell-cup, then the larger one on that.

The cell-forming stick, shaped to form a natural base, but slightly larger than that of a drone cell, is retained in a cup of warm water. The drip is shaken from this moulding stick, when with quite gentle pressure the two discs are fixed as one piece firmly into the wooden base as a cell-cup.

Meanwhile the collar or rim of wax, as it turns upwards, is worked round the stick with the thumb and forefinger of the left hand; the stick is then slightly eased and withdrawn. Although quickly and perfectly fixed, these wax bases are easily removed, and leave the wood quite clean, when so required, for a fresh start.

The fact that queen-cells, when started by the bees on new combs, have natural bases, appears to have been

disregarded by queen-rearers generally, as they have adopted the blunt rounded base as found in old dark combs.

Inverting Cell-bases—No Flanges.

The original cell-cups were attached by looped wire, but in the following year I used rows of circular openings cut in my revolving bars, and in these the cell-cups fit just tight. From the first I rejected the idea of having a flange such as others have since adopted. In this case the cell must be withdrawn upwards, although the queen-cell may be, as it often is, widened beyond the diameter of the opening, necessitating more trimming than if the cell had to be cut away from the combs.

Inverting Cell-bases.

Now the Author's cell-cups, having no flange, may be *inverted*, so that the plain ends may be used early and late in the season for attaching the single worker cells without disturbing the eggs or larvæ therein.

See the methods of cutting the combs crosswise for obtaining single worker or drone cells. This plan will assume far greater importance in the eyes of the Reader when I assert that

Longevity—the Great Desideratum—

can only be ensured where the apiarist, in addition to selecting his most desirable stock for breeding, determines to rear his queens *from the eggs, or such larvæ as may be just hatched*, and consequently too small for transferring with any certainty of the bees not rejecting them.

The Cell Nursery.

Where a large number of queens are required, as soon as any queen cells are capped, they are to be removed with adhering bees to another queenless hive retained for this express purpose within a convenient bee-house.

Mark each frame with the date of setting the eggs, and allow ten days before removing the cells, that they may remain in the correct temperature of the hive until the last, and yet be certain that none hatch to cause mischief.

Our cells, therefore, are not removed until the queens are almost at maturity, and now they are to be placed in the

Queen Nursery.

The best plan that can possibly be devised is that of using the cage (Fig. 64), which is placed over the queen or queen cells, where both honey and pollen are to be seen in the cells; in this case the queens need little attention, and always feed in the most natural manner. Where hatched in other nurseries, they should at once be placed over natural stores in this manner, as no other plan of feeding them will compensate for the loss of pollen.

The Lamp Nursery

is frequently used and is invaluable for hatching queens. It consists of double walls and bottom of copper, with stays inside to keep the water from bulging out the sides; and the internal capacity is large enough to take some half-dozen brood frames, with plenty of lateral space to spare. What might be added with benefit are small holes punched through near the upper inner margin of the copper wall to give moisture. The lid must be of wood covered with warm material, and if the whole is cased in wood, with the exception of an opening above the lamp, the temperature will be more even, and a very small flame will suffice to keep the chamber at about 95°, the boiler being filled in the first place with water at about 100°. The frames are placed in as the cells near maturity, and the young queens are removed as fast as they gnaw their way out; being retained in the tube cages in the first instance.

Let me ask those who use the hanging-frame nursery if

they have observed the temperature surrounding a queen cell with the bees always packed closely around it, thus giving greater or at least more certain heat than is required for the rest of the hive? If so, they will be surprised to find how much lower is the temperature surrounding the cells where no bees can cluster upon them, and where they do not even care to crowd upon the metal at each side of the little cages so many apiarists use in hanging-frames.* All animal life is produced by heat, varying according as the nature of the creature may require, and for our purpose the lamp nursery supplies the correct and even temperature desired.

The illustration of the Author's nursery shows the opening at the side, with a double casing on all other sides, with about one inch between the inner and outer walls. The whole of this compartment is enclosed by wood with a closely-fitting door which closes the said open side. The inside is fitted with skeleton framework, wherein slide several drawers, each covered on the underside with woven wire. The same arrangement will also take whole frames of comb, but I prefer to have the cells built that they may be removed singly and so placed in the trays. A thermometer is fixed in a vertical position at one side, thus the temperature can be noted at a glance without exposing the cells. With my arrangement, however, the heat is always given from above, and even after examination of the interior there is not the same loss of heat as with the nurseries hitherto used where the whole top is opened, as such have no large body of heat just where most needed for the immediate restoration of the correct temperature.

Under the hollow heating cylinder H C is placed the lamp, which has a wick of such a size that it cannot very

* Excluder zinc used to separate cells in a queenless colony largely overcomes this objection.

well have a flame which will overheat the chamber; the latter being about 18in. by 12in. by 9in. The boiler contains between the walls about six gallons of water, so that when the right temperature is once secured it does not vary one degree in twelve hours. The lamp is trimmed once in 24 hours, regularly every evening, so that there is no chance of the flame dropping during the night, when no attention is needed.

A sponge or cloth saturated with water, or a shallow tray holding a small quantity, should be placed in the chamber to induce the necessary moisture.

Though the time of hatching is delayed under a temperature of 90°, I find queens will come out with perfect wings, but I prefer it regulated nearly as possible at 95°, so that in case of any accident there may be no danger resulting through slight variations. When properly managed, no intelligent apiarist will deny that the incubator or lamp nursery gives a more even temperature than can be obtained in the hive. That of the former is almost perfect, while the hive varies considerably, having its entrance always open to the outer air; and when a cold snap occurs, the bees shrink away from the caged cells.

The cells are not placed in the nursery until they are capped; but I can take a cell before it is capped (when of course it is not closed at all), and relying on the perfect temperature maintained, can see the process of development gradually evolved day by day, until the young queen is matured; the delicate tracing of the wings being unfolded from white pap-like balls almost at the last day.

Make Nuclei from Queenless Stocks.*

We have provided for the hatching of our queens, and

---

* First offered as the best method in Simmins' Non-Swarming Pamphlet, 1886.

must now prepare for their reception in nuclei. These are small hives to hold from three to six frames, the latter being more serviceable for our purpose, as there is room to add fresh combs of brood when necessary.

It seldom happens that good nuclei can be made up from a stock which at the time has its queen, therefore my own plan is in the first place to make up a nucleus with the queen of the most suitable colony, being one very populous, having a number of combs with hatching brood in each. Place this queen with one frame of brood and bees, and enough more to cover two other combs, on a new stand. On the third day thereafter make up further nuclei in like manner from the same hive, leaving the younger brood in the original hive, as there will be plenty of bees to take care of the same. Bearing in mind they have already lost their queen and having prepared for building queen cells, no farther excitement will take place and not one-fourth of the number of bees will return to the old hive, as when the nuclei are drawn from one with a queen presiding.

Insert the young queens the same evening by allowing them to run in direct, or place them in that most useful

Tubular Virgin Queen Cage,

originated by myself, and which has been in use in my own apiary for many years. It was described in my 1888 edition, and again in that of 1893. It is a small tube of perforated tin or zinc, a full half-inch in diameter, and some two inches long.

The numerous advantages of this tubular cage have unfolded themselves by a gradual process of adaptation in my practice over a period of many years. As soon as I designed my new cell frame with detachable pegs in 1894, I saw how readily they would work in confining the young

queens just about hatching, until one had time to remove them. I have shown in former editions how my tubular cage was used for inserting virgin queens, either by stopping the open end with a piece of super foundation, as shown below the comb (Fig. 64) on the right; or by pressing the open end into the honey at the top of the comb; or again by inserting a ripe queen cell; and in either case, just pressing the cage into the stores near the top of the frame, the open end always being downwards. The tubular cage to the left shows the detachable cell base used as a plug for retaining the queen while shifting her.

In uniting,

the queen to be reserved is just popped into one of these tubular cages, the end pressed down into the stores, and presently when all is quiet, out she walks, with no further care from the operator. If she is wanted out soon, then the end should be stopped ever so lightly, but if it is desirable she shall not be out for a day or two, the open end is pushed harder into the honey. Perhaps you find

A Queen being "Balled,"

and instead of caging her fast, and perhaps only irritating the bees when again liberating her, all you have to do is to place her in my tubular cage, and simply press it into the comb diagonally as illustrated, where there are stores, so that she may quietly walk out after the bees have amused themselves for a few hours clearing away the broken comb, and dripping sweets. One can also

Remove one Queen and insert another

at the same operation, without any further care, or thought of failure; and it does not much matter whether it is a virgin or fertile queen to follow. With a fertile queen press the cage home rather hard in this case, but with the

virgin much harder, so that the latter may not be out until about the third day. I have practised this plan with distant apiaries, leaving a virgin where I removed a fertile queen, and at the next visit the then virgin would be a laying queen.

In Catching Queens

I present a novel method of securing them without pressure and with no need of touching them by the hand of the operator. My tubular cage is placed lightly over the queen as she is found upon the comb, and in a few seconds at latest she is running up the tube, which is lifted and at once stopped with the finger.

The illustration of the hand shows how I frequently carry queens round to the hives; for whether the cages have to be left or not, I find this a very convenient way, and after getting rid of one I often lift a frame from the hive with the four fingers still holding the cages. Of course a whole handful of these cages may be carried round with queens, if the ends are stopped with the cell pegs, with foundation, cork, a leaf,* or paper; or they may just as well be in the pockets of the operator. We now come to the

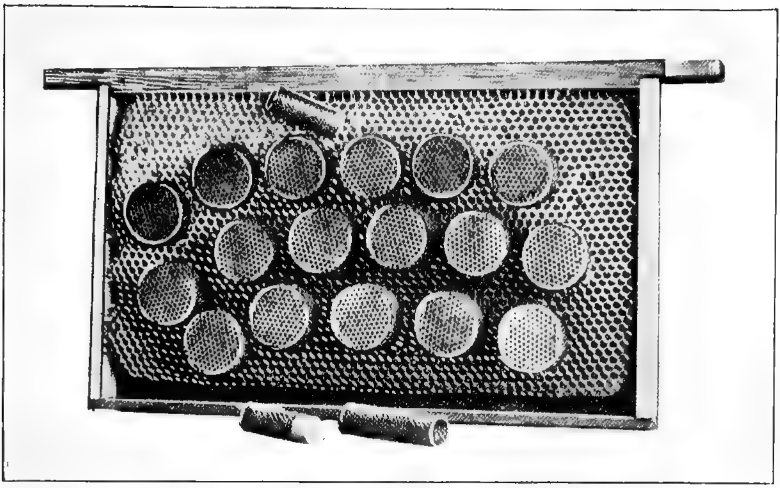
Flat Circular Cages

illustrated upon the same comb. The reader of my former editions will know how severely I have condemned the practice of

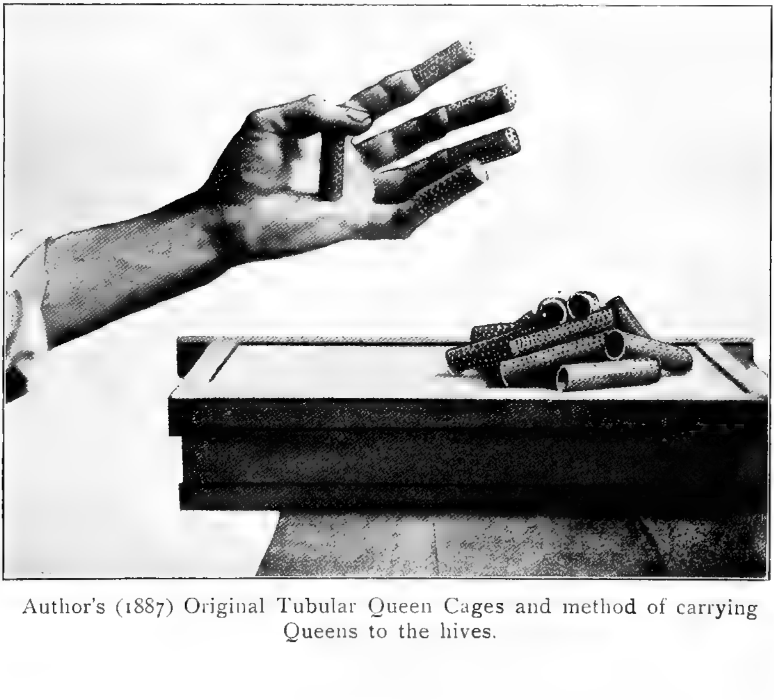
Holding Virgin Queens in Candy-stored Nurseries.

It is a plan which I have never followed, being convinced, as Cheshire has also assured us, that the virgin queen

* If the opening of the tubular cage is stopped lightly with a small portion of a dandelion leaf, the cage may be inserted and left where the Author's fasting plan is first followed; the leaf soon withers.



Author's method of holding Queens on natural stores of pollen and honey.



Author's (1887) Original Tubular Queen Cages and method of carrying Queens to the hives.

absolutely needs free access to the cells containing natural stores of *pollen*, as well as honey. When free, she receives no care from the workers, and consumes a considerable amount of pollen in building up her wonderful constitution ready for the onerous duties to follow. Consequently I select unsealed combs of stores consisting of pollen and honey, whereon the young queens are caged as shown, until they can be utilized. Twelve to 20, or even 30, are placed on a suitable comb, and these inserted between the brood combs of a strong nucleus. In this way I also have

Duplicate Queens in Nuclei ;

and liberate a virgin soon after the earlier queen has been removed. This has always saved me much time and material, as a small number of nuclei will bring along many queens during suitable weather. I have frequently mentioned that I knew of only one way of giving a virgin immediately upon removing a fertile queen, and that is how it is done. The virgin being caged all the time in the hive, the bees accept her soon after the fertile queen is removed. It is a rule that virgin queens are not accepted until after the third day from removing a fertile queen. There are exceptions, but even with duplicate queens, each must have fair play, and when considered fertile should not be sold as untested fertile queens until they have capped brood distinct from that started by the earlier queens.

Surplus Virgin Queens

will probably be on hand, and where these cannot be accommodated by breaking up other stocks, one-frame-confined nuclei may be made up provided with thorough ventilation, and in which are to be placed a comb of stores and some three or four hundred bees. These may be side combs from nuclei already established, and should contain no brood.

After these confined bees have been in an uproar for a short time, having already made provision for a small opening, allow the young queen to run in. Keep these in a dark room and presently use as ordinary nuclei.

This one-frame nucleus, as recommended in former issues of this work, is better than using twin frames or sections as "baby nuclei."

It has been observed that a young queen feeds upon pollen extensively until she has met the drone, from which time she is fed by the bees entirely upon digested food.

The confined one-frame nucleus certainly takes up more space than the candy cages, but this is amply paid for by getting more substantial stock, while queens being able to feed naturally will get mated sooner than those with a weakened constitution.

The Age of Virgin Queens

as regards natural feeding and ultimate fertilization, is practically determined as from the date they are liberated. Let there be no mistake about this, for indeed a queen hatched at a later date than one confined for a long period in a nursery, and given full liberty from the hour she hatches, will as a rule be the first to secure fertilization, and who shall say that the latter will not prove the better queen, as she has already shown herself to be the stronger.

Nevertheless surplus virgin queens of necessity confined for the first few days upon natural stores, especially pollen, do not suffer loss of vitality as in candy cages. This will be readily understood, when I show that naturally fed queens which may not be used through oversight or other cause in my own apiary, have been known to fly off immediately they were liberated from the cage, after being

confined on pollen and honey for over four weeks. On one occasion several were so confined for 45 days, and these were quite ready to fly when removed from the comb.

Queens Dying in the Cage.

Some of my correspondents appear to have a difficulty in preserving surplus queens even for a few days.

Of course care must be taken to cage the young queens on unsealed shallow cells containing honey and pollen; and they are of course in a better position where the stock has no presiding queen. But more than anything, natural vigor must be an essential feature of the strain of bees and queens that produce the virgins.

It is a fact that native queens do not stand long confinement, while the bees are more excitable than any when shut in for any reason. Some Italian queens and Cyprians, as well as Carniolans, may be confined for a longer period without much inconvenience; but the queens bred from the ordinary imported Italians and Carniolans will not sustain confinement much better than native queens.

Waste of Material and Vitality.

Where the apiarist desires to rear a large number of queens it is undoubtedly better to have a surplus of nuclei set out, rather than a surplus of queens waiting too long before they can be given a free flight.

Queens in the highest state of vitality can only be those that are free from the first. Anyone can prove that these become fertilized sooner than older queens that have been confined for some days.

This same rule, I may also add, holds good with queens reared from eggs rather than from larvæ that may be somewhat advanced.

No Waste of Queens.

As shown above, there is more certainty of the free and active queens becoming mated; but it is equally certain that queens some days confined are not so readily accepted by nuclei.

Where one has a number of nuclei queenless in advance of his supply of queens, and these have been at least three days without, there is always a greater possibility of success in the introduction of virgin queens, or ripe queen cells, with the other favorable points added.

Rule for Acceptance of Virgin Queens.

The older the virgin to be inserted the longer must the nucleus have been queenless, if the queen is to be gladly accepted. Thus where queen cells are capped almost any queen will be welcomed. Bees recently made queenless, or where they yet retain an aged queen, will accept a virgin not long hatched, where an older one would be destroyed.

If not protected, or if slightly damaged, a queen cell will be torn down where the bees have not been over three days queenless. Nevertheless an undisturbed queen cell may be given with its own comb and adhering bees in safety the same time that a fertile queen may be removed.

Simmins' Method of Nucleus Swarming.*

It will have been noticed that for supplying all hives with young queens yearly, and to compensate for the non-increase of stocks, one colony in ten is to be devoted to increase by nuclei. In this case, the tenth hives are to be stimulated for brood rearing until the end of June, when there should be at least three chambers nearly full of brood in all stages. However, to be within limit, we will say 20 combs of brood and a number of stored and partly-stored combs.

* Simmins' Non-Swarming System, Feb., 1886.

The whole tier should now be shifted to a new location, one story at a time, and then give the queenless swarm (made on the old stand) the eggs for queen-raising; this time an upper story of combs is to be added, besides filling up below, as the much larger number of bees will probably store heavily. The removed portion of the stock will still have sufficient bees to care for the brood, the extent of which will now be immensely increased, as there are not enough gatherers left to crowd the queen out, though before shifting the hive the apiarist should have been able to give the queen plenty of room by alternating brood combs with foundation as the upper stories were added, and extracting if necessary.

On the ninth day after setting the eggs, make up a nucleus with the queen (of the moved lot), this time standing the same by the queen-rearing swarm, to be united after forming the nuclei from the stock combs in a manner similar to that before mentioned, standing a nucleus by each of the full hives working for honey, to be united to them in the Autumn.

By waiting till the date named more than sufficient nuclei can be made up, while the original queen will have a full hive of bees to build up with again, and thus provide against loss, also having combs of eggs to spare for the nuclei.

Feeding Nuclei.

The most satisfactory way of feeding nuclei is by using candy in frames hanging by the combs as a dummy. Permanent syrup feeders, being part of the side walls, are not satisfactory, often leak, and syrup induces robbing where small lots are so fed. (See also "Dry Feeding.")

The Young Queens

may be mated from their seventh day until they are as

much as four weeks old. In fair weather, the rule is for them to be laying in ten or eleven days from hatching; but through unfavorable weather, I have had a number of queens under the closest observation failing to mate until the twenty-eighth day, and then successfully, having seen them come in with the drone attachment and in due course produce properly capped brood. I have had many mated at 21 to 25 days, while I have on several occasions seen queens return more than once with evidence of a successful union with a drone.*

However, when a queen gets much beyond fourteen days, it requires the most sunny and calm spell to enable her to become successful in securing a mate, though such days are, of course, always desirable. Young and vigorous queens will occasionally fly at an opportune moment, and become successful in somewhat windy weather. But the temperature must not be low. It is only under a high temperature with little or no wind that general success is attained where queens are reared on a large scale.

Nuclei should be constantly renovated by the addition of fresh brood, whether they are to be soon united or not; and they should always be in possession of stored combs, in preference to any form of daily feeding, other than Simmins' dry feeders, or frames of candy.

The dry sugar feeder, with or without the flap, is the best thing to use in supplying candy, which is poured into the frame, after the back is first studded with small nails to prevent the candy falling.

Eggs for Queen Raising

are more readily obtained from our select queens if the latter are in small colonies, having not more than

* These queens had full liberty meantime; but it is a fact that queens confined for three to four weeks, though subsequently meeting a drone, will produce only males.

four combs well crowded with bees, and protected at the sides with chaff dummies. When a comb of eggs is removed, at the same operation insert another, empty, or a sheet of foundation if not too late in the season. Continue the process every two or three days if many queens are being reared, and see that your nuclei are well prepared in advance; and where it is likely that too much honey will be brought in to hinder the queen by the little lot getting strong, then carry the queen and two or three of the best combs of brood and accompanying bees to a new situation, thus providing her with attendants mostly too young to store a surplus. Use the remainder as a nucleus, or add to another hive.

Drones

are to be produced by stock which has shown good qualities and correct colour (if required pure) for several generations back. Although the drone progeny is affected to some considerable extent by the final mating, the quality of drones used must be judged by the sister workers of the queen mother. Early drones are best secured by arranging drone comb at the centre of a well-provided stock the previous autumn. No useless drones should be produced as they consume considerable stores. A strong colony well provided and made queenless in Autumn before the slaughter is likely to commence, will save their drones till Winter, but the special breeding of drones for Autumn work must be carried on during July.

Many bee-keepers and some of the various breeders endeavour to secure the

Correct Mating of Italian Queens

in this country, but the process is such a disappointing one to the majority that the attempt is soon given up as an impossibility. Ninety-nine queens out of every hundred

turn out mismated, and the average breeder is content to produce mere hybrids. The native drone is so much stronger on the wing than the average Italian that the latter is sure to fail. Consequently

A Process of Selection

and breeding the most vigorous drones has alone enabled the Author to secure a complete reversal of the above order of mating. By this means alone he finds it possible to secure correct mating in nearly every case, because he flies only those drones that are capable of outstripping any native males that may be in the neighbourhood.*

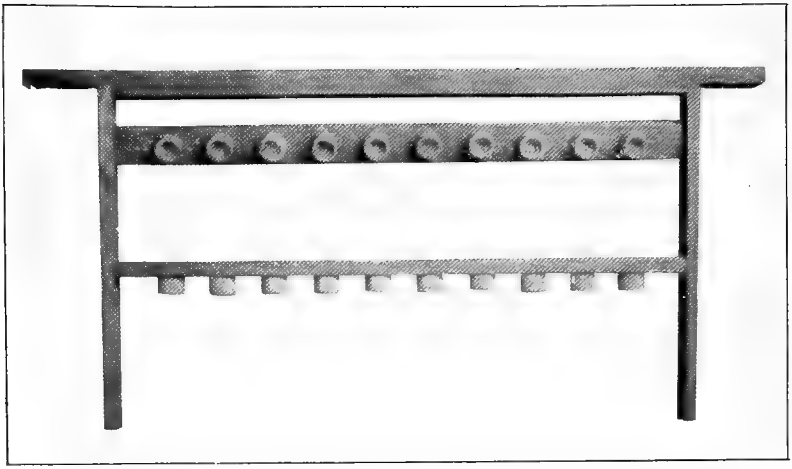
But, dear Reader, you may spend many years, or even a lifetime, in endeavoring to breed up a more vigorous strain, if you will not see the necessity of "swamping" the neighbourhood with your picked drones. They must be flying in their

Tens of Thousands,

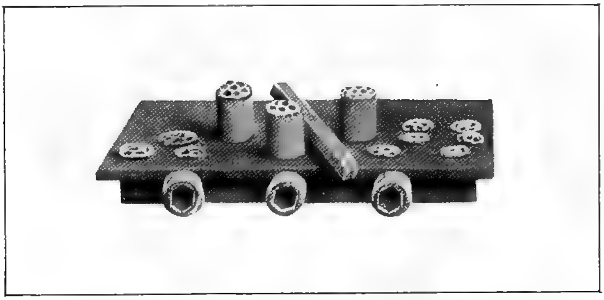
and you must not only be able to do this, but also quite prepared to sacrifice several stocks in doing it. Drone breeding colonies are of very little use for honey, and after midsummer are kept up with some difficulty, as no queen must be allowed them after the middle of July, when with liberal feeding your drones will be permitted to reach Winter if so desired ; but by then the workers, though brood may have been given occasionally, are not worth wintering. Consequently during October I usually appropriate the stores for other more serviceable stocks. On the other hand, the queenless stock may be saved by giving a fertile queen early in October, or sooner if there are no more young queens to be mated.

---

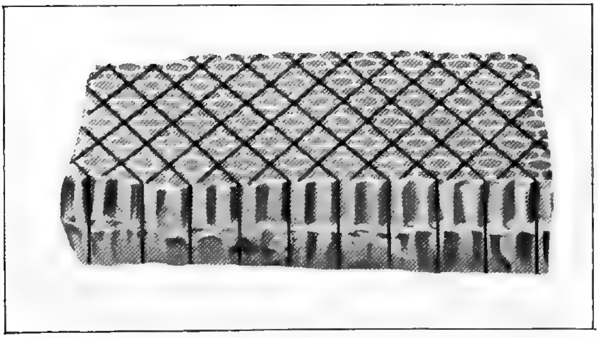
* The Author also confirms his system of pedigree breeding by securing the mating of many selected queens in Autumn after all odd drones are disposed of.



The Author's Cell-frame, with removable cups, which can be inverted; the single worker cells as B being attached to the plain side when eggs or larvæ are not removed.



A. Cell cup started with discs of foundation, without using melted wax.



B. Diagram showing how separate cells are cut when eggs or larvæ are not removed therefrom.

The Color of Combs

adjoining newly capped honey is known to determine to some degree the shade of the cappings then used, but it is a fact not generally realized that if dark combs are used for the rearing of queens, those of a yellow strain will to a large extent have their color impaired by the contact; while very new and thin combs will have exactly the opposite effect, ensuring bright yellow queens.

One may lubricate or wipe out his cell-cups with honey, only to find that the queens therein produced are much darker than others from a yellow queen, whose cells may have been cleaned with warm water or not at all, if new.

Dark queens may also result from a lowered temperature, and more particularly if stinted in food, when reared at an unsuitable season, or started from larvæ already well advanced with the food designed for producing a worker.

Stock Frames *versus* Twin Frames.

The late Mr. F. Cheshire illustrated in his early work, *Practical Beekeeping*, a set of twin-frames that could be used in the full stock chamber or a smaller nucleus hive when folded; and others have advocated similar frames; but the Author has found no economy in using anything smaller than the British standard size; as with the larger frame stocks may be readily built up from nuclei, or nuclei replenished as desired from stocks without waste of material and bees.

Each stock should be supplied with a young queen every year ; not only as a greater safeguard against disease, but also that a supply of young bees may be ensured (from a July-reared queen) before Winter ; and as a guarantee that the colony shall rapidly build up to unusual numbers in time for the first early yield of the new season.

CHAPTER XXI.

INTRODUCTION OF ALIEN QUEENS TO STOCKS AND NUCLEI.

ONE of the most interesting features in connection with Modern Bee-keeping is that a stock may be wholly changed, as to colour of the bees, their temper and general disposition, by the simple act of inserting a fresh queen. Under some conditions the bees will not hesitate to destroy the stranger, and various ways have been devised to guard against this disposition of theirs. The different methods come under two distinct systems : the old, called "Caging," and the new, known as "Simmins' Direct Introduction."

Generally speaking, the caging process is carried out by placing the queen in a small perforated compartment, wherein she is confined between two combs among the bees for 48 hours, when the bee-keeper opens the hive carefully and allows the queen to run among her new subjects. If then attacked, she must be again confined, and tried after the lapse of another twelve hours.

Direct Introduction consists in so inserting the queen without confinement that the bees are either unaware of

the new arrival, or are taken advantage of in such a manner that they do not attempt to molest her.

Of course it is understood that no other queen is to be in the hive at the time another is to be given, or the new one will usually be destroyed, unless the presiding queen is aged. The novice may experience some difficulty in

Finding the Queen

to be superseded, and he will certainly do better to leave his queens alone until he gains more experience, unless he is absolutely certain they are actually failing.

In frame hives the fertile queen can generally be found without much trouble, as she is parading the brood combs, the hive being opened with as little disturbance as possible, and the frames gently lifted and examined one by one. If not to be seen there, look well around the edges of the combs, or she may be found on the floor, or at one corner among the bees; it may even be necessary to remove the combs to a temporary hive while looking for her around the sides, taking care not to get the brood chilled. An unfertile or virgin queen is often most difficult to find, and at times even an expert bee-keeper would be tempted to say that no queen was there, were it not that the actions of the bees tend to show otherwise.

How to make Sure.

A careful examination will generally reveal her presence; but failing to find her, when you think there should be one, the bees should be given a comb of unsealed brood, and if they build queen cells thereon it is almost certain no queen is there; if otherwise, do not risk the life of a valuable queen until the other has been found. With fixed combs the only way is to "drive" the bees out and catch the queen as she ascends. If that cannot be done, then look well among the deserted combs and the bees clustering

in the empty skep. The length of the body, as well as its brighter color, should enable one to distinguish the royal form, while it should be remembered that the queen's legs are always of a reddish-brown color, those of the workers being much darker.

INTRODUCTION BY CAGING.

Procure a cage made of fine perforated zinc $1\frac{1}{2}$in. in diameter, and 1in. deep, having one end only closed with the same material. When the queen arrives place her in this cage while yet indoors, slip a thin card under and carry her to the hive. Without removing the frames other than to give plenty of room laterally, slide the cage carefully from the card on to uncapped cells of honey, within the margin of the cluster, and press it down to the mid-rib of the comb with a cutting motion. The queen now has plenty of food, and if the perforations are fine enough the bees are unable to molest her. After 48 hours, give a puff or two of smoke, carefully examine the condition of the bees nearest the cage, and if simply passing their tongues through the perforations, the queen may be released without fear of the bees attacking her, but all the same watch their actions closely for a few moments. If all is well the bees will gather around her, but not thickly; those nearest will clean her with their tongues, while one or two may be seen feeding her. Under that condition the hive may be closed and left, but should they be found clustering tightly in large numbers about the cage, at once close the hive and wait another twelve hours; and in case a queen is attacked after being released (which is known by the bees forming into a knot about her and stinging each other in their endeavor to so do to the stranger, called "balling"), then confine her again, first dispersing the angry cluster by heavy smoking.

When inserting queens by caging, it is necessary to keep all queen cells destroyed, or the new-comer will seldom be received. She is to them unserviceable, and yet present in the hive all the time the bees know they have the means of raising their own, and hence a dislike once began is only fed into an angry flame simply by the continued irritation caused by the constant attempt to get at the stranger, and not seldom by the bee-keeper's own interference. Under this process of frequent disturbance, the queen will sometimes even herself be the first to attack the bees, and then, of course, there is no hope for her if not again confined.

The Benton Mailing Cage

has made it possible to insert queens safely without removing them from the mail cage. Most cages sent out by breeders now have a plug at one end, nearest the supply of food; and the cage being placed above the frames after removing this plug the bees gradually dispose of the food and so quietly liberate the new queen.

But many losses occur by this plan where bee-keepers will not acknowledge the simple natural laws which govern the action of these interesting insects. If the queen is not likely to be liberated the first night after the old queen has been removed, she should not be allowed to escape until the second day has passed; this being the most fatal period of any, as the bees having a lot of queen cells just prepared are bent upon destroying any new arrival inserted by the caging processes.

Mr. G. M. Doolittle, an American bee-keeper, uses a flat cage, having an area of 4in. or 5in. square; this, with the queen in, is pressed down to the mid-rib of the comb just over hatching brood. Of course all the young bees hatching out pay homage to the only queen they know;

and the cells thus vacated are occupied by eggs laid by the confined queen. By this time there is not much doubt about the queen being accepted by the rest of the population, and she may be released. In this case it is evident that food must be present, therefore see that the cage also takes in an inch or more of sealed store.

Self Introducing Mail Cages.

It may be taken as a fact that the perforated zinc or wire netting covering so generally adopted in a non-practical application, is detrimental, and frequently defeats the object in view.

The supposed object of the metal perforations is to prevent the immediate destruction of the queen; while the fact is overlooked that this semi-contact only inflames the anger of the bees, and prolongs that undesirable condition, as with all caging methods.

The wide Saw-cut sufficient.

The better plan is that provided by the Author from his earliest use of the mail cage—a wide saw-cut made through one end of the cage, and which also ensures more efficient ventilation than the small and almost useless pinholes so frequently used. This saw-cut allows of all-sufficient communication, while avoiding the needless anger aroused by the perforated metal sandwiched between the cage and the hive bees.

A queen inserted by the mail cage should not be deprived of the workers, as she may thus be left indefinitely, and die before the bees can liberate her.

DIRECT INTRODUCTION.

A term first applied by myself in the year 1881, will be found much more simple than the foregoing, in that it enables the bee-keeper to insert a queen without loss of

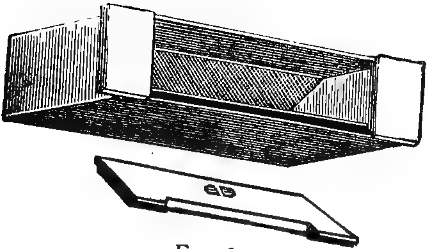


FIG. 65.
Champion Frame Syrup Feeder.

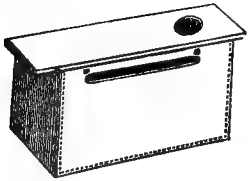


FIG. 66.
Simplicity Frame Feeder.

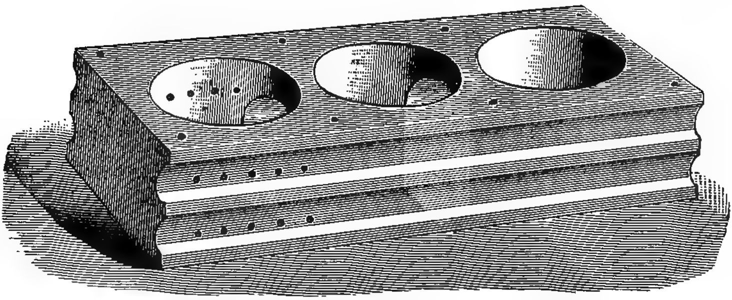


FIG. 67.
Benton Queen Postal Cage.

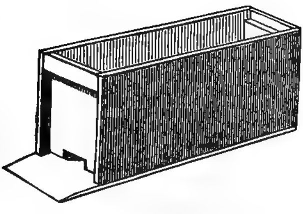


FIG. 68.
Single Nucleus Hive.

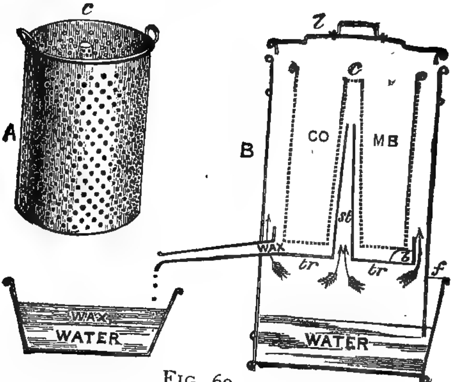


FIG. 69.
Sectional View of Wax Extractor.

time and by two of my own methods to any colony, at any time of the year, whatever be the condition of the hive, whether it contains queen cells up to the point of hatching, brood in every stage of development, fertile workers, or no brood at all.

Simmins' "Comb Method,"

first brought to public notice by my pamphlet in 1881, consists in taking a queen from a nucleus, or otherwise, upon the comb she is parading among her own bees, and then inserting the whole into the desired hive, using a little smoke as in ordinary manipulation. Be careful to carry the comb in an *uncovered* box from nucleus to full colony, and before inserting the same, part the combs of the hive to give plenty of room and admit light. (See also "Uniting.")

Simmins' "Fasting Method."

The three things of importance to be observed (after removing the old queen at mid-day, if one) are as follows:—(1) Keep the queen quite alone in a temperate place free from strong odours for not less than 30 minutes; (2) she is to be without food meanwhile; (3) and to be allowed to run down from the top of the frames at dusk. There is no objection to the cheap "safety" match boxes so commonly in use, but my own practice is to carry the queens in small tubular cages made of fine perforated zinc or tin, one end permanently closed, while the other end is pressed into a piece of foundation after the queen is in. When ready, remove the foundation and let her run into the hive; otherwise stop the end with a thin leaf. Caution:—make no examination after inserting the queen, by either of the two foregoing plans, until 48 hours have expired.

The above meets all requirements, whether the colony has been long, or only a short time queenless; if it has

brood or not, or queen cells in any stage of development. It is also applicable to any season of the year.

Immediate Introduction,

so named by the Author, as a slight variation from Direct Introduction, is a practice he has followed for many years. The fresh fertile queen is given at the same moment the other is removed, during the day, and with just ordinary smoking.

If the new queen had been laying in the same apiary and is young, no preparation whatever is necessary; otherwise she may be placed alone as before for not less than 30 minutes before making the exchange.

Twelve Hours without Food.

Late evening, after the 30 minutes fasting, is the best time for the average bee-keeper to insert queens; but nevertheless the Author does not confine himself to this late hour, and frequently inserts queens at any time of the day.

A queen may be confined alone for an hour, or two or three hours, if warm, without detriment. In one case the Author left a queen quite alone in a tube cage for twelve hours without food, at a temperature of 50°, and when given to a colony she appeared to be none the worse for her solitary confinement, and produced worker brood in regular order.

Loss of Queens by Flight.

While being transferred to the hive after the period of fasting, a queen is sometimes lost. This can be avoided by using the Author's tube cages, stopping the opening with a piece of dandelion leaf, lightly inserted. The tube cage can then be placed across or between the frames, and left just as it is, as the leaf very soon withers and the queen quietly walks out.

Being hungry, she has no thought but that of immediately soliciting food from the workers or seeking it herself.

Waiting 30 Minutes.

There is no loss of time in thus waiting. As a matter of fact, the apiarist confines the queen in a tube, and places it in his vest pocket while he does something else.

In the Author's case he may so prepare 20 or 30 at one time, and presently insert them in many less minutes. It may safely be said that no more expeditious or simple method can be found.

Strong Odors

should be avoided as far as possible as regards to the queen to be inserted, but it may be generally accepted as a fact that where the bees are in a naturally receptive condition, they will accept a vigorous young queen regardless of any slight odor that may be strange to them.

Introduction by Chloroform,

puffball, &c., is sometimes recommended, but I cannot advise such a course as to reduce the bees to a state of stupefaction, being not only injurious but totally unnecessary. Mr. D. A. Jones, late editor of the *Canadian Bee Journal*, formerly a great advocate of this method, discarded it in favor of my Fasting plan, which he considered the most satisfactory of any.

Covering Queens with Honey, Flour, &c.

It is claimed by some that a queen is generally accepted if first covered with honey and then placed among the bees ; but the practice is one of very doubtful utility. Another plan offered is that of giving the queen a bath in tepid water, when it is asserted she will be at once accepted. The body of the bee is studded with breathing tubes ; it is,

therefore, evident that much mischief, if not permanent injury, is caused by all being clogged with honey; while dust, such as flour, for uniting bees or introducing queens, is a crude and unnecessary process.

Running Queen and Bees in at the Entrance.

Another method of doubtful utility sometimes recommended, is that of shaking all the bees from the combs on to a board in front of the hive, and as they draw back through the entrance allowing the new queen to run in with them.

Introducing Queens to Hatching Brood,

denuded of bees, is another plan sometimes offered, but of somewhat doubtful value. The brood should be kept warm, and of course the queen is safe for the time being if the hive is closed with perforated zinc. But the fertile queen is not properly nourished, no honey is being gathered, and no food will be taken from feeders by these soft youngsters. Probably much of the younger brood dies, and presently the valuable queen is missing.

Bees Refusing Queens.

Sometimes a nucleus or stock will refuse queen after queen, and in that case they may be given a capped queen cell. If this fails they will often be reasonable by the time they may have been allowed to rear one for themselves. Otherwise they may be treated by the confined nucleus plan as a swarm, and allowed to build new combs, all others being removed.

Inserting by Heavy Smoking.

The late Henry Alley claimed uniform success by smoking queens in at the entrance, using dense volumes of smoke. Mr. A. C. Miller also, an American bee-keeper,

has more recently claimed the idea as universally successful. He drives a dense mass of smoke into the entrance before and after running the queen in, and then stops the opening with grass for a few minutes. Mr. Alley omitted the latter.

Simmins' Nucleus Method.

A plan which I have found very satisfactory, and which was first suggested to my mind by the fact that I had long made a practice of sending queens off with bees they had never seen until the moment of fastening down in the various receptacles they were to travel in, is as follows:—Make up a 3-frame nucleus in a small hive $14\frac{1}{2}$in. by 11in. inside (allowing $2\frac{1}{2}$in. space under the "Standard" frame); then confine the bees, with ample ventilation, and having found themselves to be queenless, let the new arrival run under one corner of the quilt, first driving the bees back with a little smoke. Keep them thus confined in a darkened room, and liberate on the evening of the third day, standing the nucleus where it is to remain; and as soon as strong enough give a frame of hatching brood at intervals of seven days. Before inserting the queen, she should, for greater security, be kept alone and without food for 30 minutes.

Mr. Doolittle (of America) also appears to have discovered that confined bees will readily accept a strange queen. His plan is to shake the bees into a box, well ventilated, and as soon as they are in distress at the loss of their queen, he allows the new one to run among them through a small opening, otherwise kept closed. In a day or two the bees are placed upon brood and store combs, where it is intended they shall remain.

In times of scarcity it is always better to have the feeding-bottle going when it is decided to insert a queen by any caging process. All the foregoing plans have

reference to fecundated queens, but with regard to the introduction of

Virgin Queens,

hitherto there has been some uncertainty, but satisfactory plans I have found are :—(1) By introducing to a confined nucleus as shown above for fertile queens ; (2) by the tubular cage before mentioned ; in this case pressing the open end into *thin* foundation after putting in the young queen, or by pushing the open end diagonally downwards into the sealed stores near the top bar ; (3) by allowing three days to pass after the removal of a fertile queen, and then inserting at night, and (4) by duplicate queens caged where a queen already laying is to be removed. (See also " Queen Rearing.")

Queen-cells may be inserted three days after removing a fertile queen ; or at the same time if given with a comb and bees just as removed from another hive, and without being damaged in any way.

Two Queens Working Together.

It is quite often found among Italian bees, that two queens—an old and failing mother and her daughter—will be allowed in the same stock, and deposit eggs side by side.

An Australian bee-keeper, Mr. Beuhne, not long since said he thus always gave a queen-cell where the original queen was over two years old, and he presently found both laying. But as old queens should not be allowed there can only be loss by waiting so long before replacing the old queen.

Many years earlier Mr. D. M. Doolittle offered his spiral queen cell protector for inserting queen cells with a similar object in view.

Queens Dying in Cage.

When inserting queens by the cage it sometimes happens

that they are found dead. This may result from either want of food, or death by stinging or worrying, as the perforations are too large in almost all cages used. The former shows the danger of using such cages as do not press into the combs, should the bees be disinclined to feed the stranger; while the latter evil can be remedied by using perforations no larger than an ordinary pin will pass. We may now, indeed, consider the period of uncertainty, as in the days of queen caging, to have passed away. Under the Author's own management, the subject of queen introduction has been reduced to a certainty. In addition to the methods of direct introduction already enumerated, the experience gained by an extensive practice has resulted in the following further observations, which must prove of service to many who may have cause to introduce queens.

Certainty in Giving Valuable Queens.

A fertile queen is rarely objected to where queen cells are already capped over, and one may be run in at any time of the day. Any such colony will also accept a virgin queen right away, and if broken up into nuclei the respective divisions will accept one or more fertilized or virgin queens. Upon the removal of a virgin queen, a fertile one will almost certainly be accepted if inserted at the same operation. In each case it is of course safer to keep the strange queen alone for 30 minutes.

A colony deprived of the queen and the whole of its brood will accept either a virgin or fertile queen as soon as they are in an uproar because of such loss. The absence of the queen is detected almost immediately when the brood also is removed. Many bees are lost if bees are allowed to remain thus deprived for any length of time. My first Holy Land queen was introduced in

this way prior to 1880, and though there is some trouble in removing the brood, I have always found the plan reliable, and the bees humming merrily, in possession of a new queen, within an hour of the removal of their own queen and brood.

Simmins' Direct Introduction Proved.

The late Mr. F. Cheshire's testimony in his valuable work confirms the value of my system. "Following up the question, I tried many dozens of experiments, and found that by Mr. Simmins' method it was quite easy, and not only to introduce, but to get one queen *to lay* in half-a-dozen distinct hives in a single week. . . . My trials have, I believe, embraced almost every supposable difficulty and variation in season and in the condition of the stocks, and show the system to be practically perfect. . . . . Direct introduction, as taught by Mr. Simmins, has saved me queens, time, and anxiety, and I feel pleasure in expressing my indebtedness."

Yet other evidence is given by the editor of the *Bee-keeper's Record* of Dec. 1st, 1887. After detailing his experience in inserting by my method seven queens "at a season and under circumstances such as made us formerly careful to an extreme, we are glad to be able to pronounce the method a complete success. . . . We can now understand how friend Simmins is able to guarantee safe introduction, and we rejoice at being able to chronicle another point gained."

In his issue of July 1st, 1889, the same editor, in reply to a query as to how the frequent losses of valuable queens could be avoided, gives some further very pertinent and convincing evidence: "Our advice is that readers should adopt the method of direct (fasting) introduction, as advocated by Mr. Simmins. It is simple, involves little

trouble or disturbance, and as to its efficiency, well, we have never lost a queen by it."

The foregoing statements will show the value of the system as applied to varying conditions of the bees, or the seasons, and as the editor of the *Record* himself says, "The introducing cage bids fair to be relegated to our collection of curiosities."

The careful bee-keeper will no more think of neglecting to feed his bees in proper season than a stock owner will fail to provide suitable food for his cows, from which he anticipates a profitable yield of milk and butter.

The recognised substitute for the nectar of flowers, either as refined cane or beet sugar, is found to be fully equal, and for some purposes superior to the natural produce, for the preservation of bee-life.

CHAPTER XXII.

FEEDING AND FEEDERS.

THOUSANDS of colonies are carelessly lost every Winter—in many cases where the bees are left with natural stores, and in very large numbers where a deficiency of food has not been made up by supplying sugar syrup.

Many owners take all they can from their bees, giving nothing in return, thus robbing their own pockets. Others deliberately rely upon candy as a substitute in Winter; instead of feeding with syrup during September, and thus leaving the bees comfortably settled between properly sealed stores.

Sugar Syrup *versus* Honey.

Reports from many very extensive owners of bees, with 30 to 40 years of practical and extended experience behind them, show conclusively that syrup from refined sugars is a more satisfactory food for bees in Winter than the nectar of flowers. Hence the statement made by some amateurs of little experience that sugar feeding is detrimental, and

predisposes bees to disease, is but a phantom that exists in their own imagination only.

Where disease has been prevalent in a given locality, it has been shown over and over again that the only stocks escaping have been those fed with syrup during the Autumn. On the other hand, syrup feeding gives one the opportunity of adding a germicide to the bees' Winter food ; and it has been then demonstrated that the stocks to become first affected with the Isle of Wight disease, or those that died out during Winter from the same malady, have been such as were left entirely upon natural stores, the owner thinking the latter quite satisfactory.

The Author feeds refined beet sugar by the ton in his queen-rearing apiary ; and does this practice, think you, cause any deterioration in his stock ? Let the reader judge for himself when I tell him that starting as a nucleus in Spring the stock as it developed yielded 170 lbs. of honey the same year ; another queen from the Author's apiary gave 357 lbs. of honey from one stock ; others during the rather poor season of 1912 gave from 100 lbs. to 185 lbs. to the colony.

After the 1912 season, one of the great daily papers had a startling heading, "Sun-starved Bees," and gave a doleful account of bees dying all over the country because there had been so little sun ! This was a calamity that the Author could not realize, as such a situation had never come under his notice and could only occur through negligence. His own bees were snugly tucked away between sugar-stored combs ; and even normal deaths appeared to be less than usual.

Although August of that year was persistently wet, and September unusually cold, the bees consequently discontinuing the production of young earlier than usual, the whole apiary roused up and the stocks developed

more quickly than usual during the Spring of 1913; still with an unusually small number of normal deaths—and, be it remembered, sugar syrup was the great stay.

In the apiary where bees and queens are raised for sale, feeding has often to be resorted to during a dearth of honey, in the production of bees and queens on a large scale. Colonies are depleted by sub-division to such an extent that the remaining bees are occupied entirely in brood rearing, forced on to the utmost by the master. Honey is quite a secondary object; bees *must* be had. Consequently, honey cannot always be obtained even when the average colony is storing, and the forcing process must therefore be kept up by some substitute.

Simmins' Dry* Sugar Feeding.

For Spring feeding generally, and for use with nuclei, I have found nothing so stimulative as my plan of dry sugar feeding. The feeder consists of a hollow dummy with one side hinged on simple wire nails and held by the same above; or by staples turned at right angles to project over the margin below and a turned wire inserted at either corner at the top, which can be moved out of the way to allow of easily removing the side. The space between the sides should not be more than one inch, or comb will frequently be built therein.

Correct *versus* Incorrect Application.

Uncooked, soft sugar feeding became practical only when I introduced the feeder that enabled it to be carried out in an economical manner; but unfortunately substitutes have since been offered, being incorrectly constructed and applied.

You see, the bees must cluster in a dense mass in the

* As distinguished from syrup.

narrow chamber (Fig. 15), therefore maintaining a high temperature, and under this stimulus they quickly reduce the soft grains of sugar without waste.

The advantages of this feeder have been acknowledged by many British bee-keepers during the past 30 years, but our American friends are but just realizing the benefits offered by the plan for stimulative feeding, for feeding nuclei without constant attention, and for the economic feeding of out-apiaries in times of dearth.

Ed. E. R. Root, of *Gleanings in Bee-Culture*, suggests the use of Coffee A sugar for this class of feeding, and recommends its use over the cluster in paper dishes in times of scarcity. The Author used moist sugars in this way over skeps as well as frame hives in the early 80's.

The bees should be crowded into the feeder, and if placed

Next to a Frame of Brood

they will quickly work into this frame or dummy feeder, when the temperature of the whole hive will rise, and the brood nest be greatly extended.

Granulated sugars cannot be used, but that known as Porto Rico, a soft, moist article, is used, being pressed in tightly, and the bees, entering above the movable side, which does not reach the top bar by ¼in., are soon busily engaged in reducing the food to syrup. No dark moist sugars are suitable as a Winter food in cold latitudes.

Any moist cane sugar will do for this class of feeder, and the same frame also makes an excellent candy feeder.

The feeders are placed as an ordinary frame at the outside of the brood nest and the bees allowed only so many combs that they are crowded into them.

Another very serviceable frame feeder I have in use for moist sugar holds 9 lbs. or 10 lbs., and is 3in. across. The bottom is simply a sheet of finely perforated tin fixed in

an arched form, so that the bees may cluster under and appropriate the sugar through the perforations.

Syrup Feeders.

If a stock happens to be very short of stores in Spring, I find it best to give a feed of syrup to put the bees in good heart, and then follow with the dry sugar or candy. In Autumn, when the surplus receptacles are removed, it may be too early to finish off feeding all at once, and it is well to give 10 lbs. or 15 lbs. of syrup immediately and finish gradually with a 10-lb dry feeder. This is, of course, where all the honey has been placed above, but where any have considerable stores on hand but not enough to winter, the balance must be made up rapidly with syrup not later than the end of September; when it is necessary that the combs should be almost solid with food.

Simmins' Syrup Frame Feeder

holds about 12 lbs.; is 3in. wide, and otherwise of the dimensions of the frame in use. The joints are all tongued and well put together that no leakage may occur, though it is advisable to paint the whole inside to prevent saturation.* There is a slot along the top on one side nearest the bees, by which they are allowed to enter a ⅜-in. passage between the outer and inner wall, where a good footing is obtained while taking up the syrup. The sugar is held clear of the bottom by slats of wood, thus admitting of a free circulation of liquids under the dissolving sugar. No cooking therefore is necessary, as the usual quantities of sugar and water (a pound of sugar to half a pint of water) soon amalgamate in the form of syrup. The proportions named happen to be correct for

---

* In this case the sides must either be roughened after painting, or covered with gritty paint, unless the boards are unplaned.

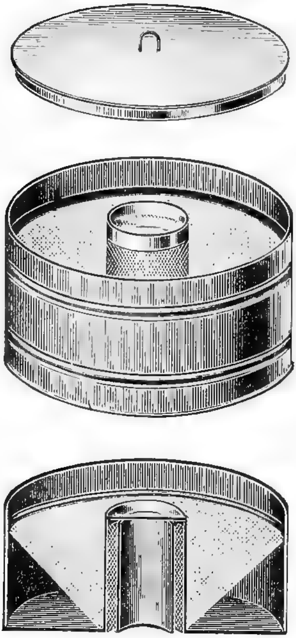


FIG. 70.
Simmins' Circular "Amateur" Feeder (1883).

FIG. 71.
Raynor Bottle Feeder.

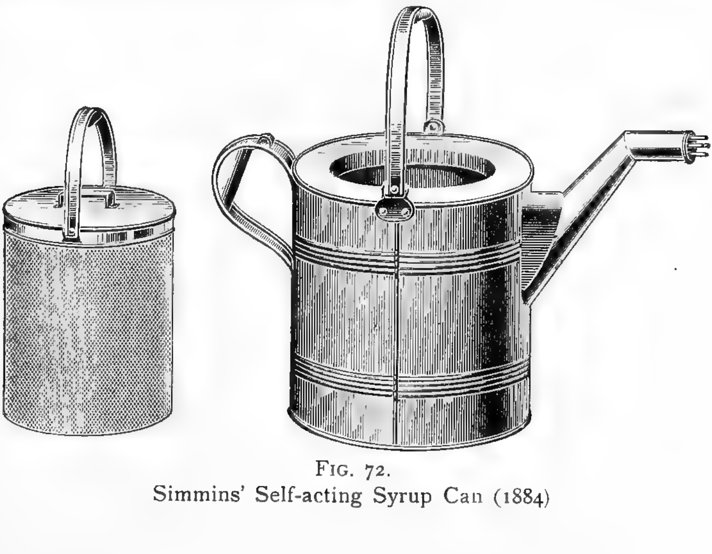


FIG. 72.
Simmins' Self-acting Syrup Can (1884)

this system, as it will be found that a residue of sugar will be given where more than the pound is placed in the half pint of water.

The Circular "Amateur,"

for use above the quilt, I have arranged upon the same principle, as will be readily understood by the illustration (Fig. 70). This holds about 7 lbs. or 8 lbs. at a time, and the inner funnel leading up to the syrup passage around the same is lined with wood, or a lamp-wick can be used leading down into the cluster in cool weather; though if feeding is necessary at such times it is always more satisfactory if the syrup is warmed. Among

Bottle-Feeders,

we have the "Raynor" (Fig. 71), arranged to give a graduated supply, with a projecting point attached to the perforated metal cap of the bottle, indicating by the figures to which it points on the stand the number of holes to which the bees have access. The underside of the excavated block is lined with warm material, though generally of a kind that is annoying to the bees, and which they soon tear away. If painted with wax it would be equally as warm, and more appreciated by the bees.

Messrs. Abbott have long had something similar, though more simple and less expensive; but there is one great disadvantage with all bottle-feeders, in that they are subject to atmospheric pressure, and with a sudden rise of temperature the expansion causes much waste of syrup.

Percolating or Self-Acting Feeders.

I have used large cylinders on the self-acting feeder principle which reduce about 2 cwt. of loaf sugar at a time, the syrup being drawn off by a treacle valve at the bottom. The syrup-can illustrated (Fig. 72) will also be found very

suitable for smaller quantities, saving much time and trouble in cooking; the self-acting principle being the great feature in this, as in my Champion Feeders. Cold water reduces the sugar to the correct consistency, but hot water is best in cool weather.

Inexpensive Bottle-Feeders.

A double thickness of cheese-cloth, or old linen, being tied over the mouth of a common jam jar, the bottle is inverted and placed flat on a thin block at the back of the hive. If slow feeding is desirable, then use the plain side of the block as on the left: if faster then invert it over the grooved side; or for rapid feeding, tilt the bottle up at one corner. Of course, in this case two or three of the combs are removed from the hive, and the plan is not only inexpensive, but has the advantage over top feeders in that the syrup is soon raised to the temperature of the hive, as also is the case with my frame feeders. These bottles can be used inverted close on the bare frames when in cool seasons it is found necessary to feed a stock.

Feeding up 100 Colonies in a Week.

A very simple feeder is one adopted by myself many years since, and by its use it is possible to feed up 100 colonies in less than a week, each stock being capable of carrying 12 lbs. to 15 lbs. of syrup from the feeder to the combs in a single night; the best time for filling the feeders being about dusk, as this avoids robbers, and also prevents loss of bees through flying because of the sudden excitement.

Good sound wood is selected, and plain boards fastened on each side of a frame of any desired width, the corner joints being tongued. Put the nails in rather close together and paint all joints with white lead before making up (Fig. 66). The syrup is poured in while warm, after

turning back the quilt, and the bees go in by a slot on the side. It does not at all matter about pouring the syrup over any bees that may be in the feeder, as they are soon cleaned up by their fellows. A float is used and should be ½in. narrower and shorter than the inside of the feeder.

In many apiaries feeding is seldom resorted to, but there are times of dearth when valuable colonies would be utterly ruined were it not for the timely assistance rendered by the owner—assistance that sooner or later is repaid a hundredfold.

Of course, if feeding is absolutely necessary after the surplus receptacles have once been occupied, it must be simply from "hand to mouth," that nothing be stored in supers; while it may even be desirable to remove such entirely, replacing them when better times put in an appearance.

Feeding without Feeders

is something that needs our attention before closing this chapter. Of the various methods offered for filling stock combs with syrup, to be placed in the centre of the brood nest for stimulation, or near the outside for storing, no plan can be so effective and simple as that employed by the late Mr. W. Raitt, of Scotland. He used a common syringe, placing the comb in a drip pan, while driving the syrup into the cells. The filled combs are carried to the hives requiring them, while sometimes a chamber is filled up with them and placed bodily under the stock chamber which has to be stored.

A simple method of giving moist sugar is that of first placing a layer of strainer cloth upon the frames; the sugar above that, and pressed into a compact mass, with the usual quilting next that, nicely tucked up to keep all

warm. Common paper will do in place of the straining cloth if two or three holes are first made through to give the bees a start.

Feeding with Candy

is another matter requiring serious consideration, for certainly it is a process more frequently abused than properly used. This article has generally been brought into requisition where stocks from any cause have run short of food too late in the Autumn, or during Winter, when it is supposed other plans of feeding could not be adopted. But with due care, no stock need be left alone long enough to get into that state. It should be distinctly understood that

No Feeding should take place in Winter,*

and though candy is often recommended, it is far better to unite to a well-stored stock in the Autumn than to feed in any way during the months of repose. If a stock is found deficient in stores at the latter part of Winter, then give combs of sealed food with as little disturbance as possible ; placing such flat on top of the frames and covering up warm if the weather is very bad. It is better at any time in Winter to give a dose of hot thick syrup, if only two or three pounds than to rely on candy. The object is to get the bees along until February is well advanced, and to feed not at all until then if possible.

No stock, however disheartened, will refuse to take a bottle of hot syrup, placed directly over the cluster on to the naked frames, and in two days or less they have the best of food around them with but little excitement, while candy is a cause of constant activity.

---

* Some bee-keepers, knowing their stocks are short of stores in Autumn, deliberately rely upon candy as a Winter food, and frequently suffer heavy loss in consequence.

The most Profitable Period for using Candy, indeed the only safe and profitable time, is from the month of April onwards, while building up stocks ready for the harvest. The progress of a colony at this time is most remarkable where candy is judiciously applied in frames holding 6 lbs. or 8 lbs. at a time, while thin syrup is also supplied. This has been my practice for many years, ensuring as it does, constant progress, no matter even if there may be a temporary return of frost and snow, as frequently happens to the serious detriment of many apiaries.

In making Candy

the usual proportions are one pint of water and one wine glass of vinegar to 8 lbs. of good loaf sugar. This is stirred well over a clear fire until all is melted, and is then allowed to simmer with occasional stirring until a drop or two placed on a cold plate will almost immediately set hard, or will at least not stick to the plate. A large news sheet placed on a table with the edges folded and turned up at right angles all round, and these blocked upright with pieces of wood or other articles, will form the most convenient receptacle for general use. As soon as the surface is set, it should be cut across with a knife so that suitable sized cakes may be had without waste in breaking.

Candy is sold by British manufacturers in common sections, and larger boxes to be placed over a feed hole cut in the quilt, and with a sheet of glass over the top.

Where systematic Candy feeding is to be carried on in Spring, the better plan is to pour the hot liquid into wired frames, fastening them down to the table or a flat board, with paper between, by means of a couple of nails, or specially prepared blocks. It can also be poured into the dry feeders, which are first studded with fine nails.

The vinegar can be dispensed with and a much better quality of Candy secured by using only one pint of water with 1 lb. of honey to 8 lbs. of sugar, but this should only be used where it is known the honey is free from disease. Honey Candy should never be bought, unless the seller gives a guarantee that the honey used is free from danger.

The Author's Candy

is made as follows. Place 8 lbs. of good loaf sugar in the saucepan ; upon this pour three parts of a wine glass of vinegar ; add three parts of a dessertspoonful of salt ; and finally one pint of *boiling* water. This is placed over a steady fire, and constantly stirred until all the sugar is melted. Bring it to the boil, keeping a strong clear fire ; now stir occasionally and presently try a few drops on a cold plate. When these do not stick to the plate, setting hard quickly, it is ready to turn out ; but before doing this remove the pot or saucepan from the fire, and allow the boiling to subside slightly. It is just now that any medicinal agent, if needed, should be added. Any scum should be skimmed off.

Candy and Isle of Wight Disease.

Where this disease is in evidence, the application of Candy at any period is very detrimental, largely increasing the rate of mortality. In late Autumn and Winter its use is suicidal and will always hasten the destruction of any affected colony.

Out-Door Feeding.

I must not fail to notice this question as it is one of considerable importance, and yet just here is a rock on which all hopes of success may often be dashed to pieces. It is at once the most desirable method of feeding, and the greatest of stimulants to increased energy and development

on the part of the bees; while it can also be shown as the most destructive to bee-life where all the points to be considered are not well understood.

During the Spring

nothing of the kind should be allowed until the population of the hives has been largely *renewed* by young bees, and then with due care in placing the feeding apparatus in a warm sheltered corner, the result will be remarkable.

At least double the usual quantity of water must be added to the syrup and the feeders placed some distance from the apiary, that robbing may not be induced.

In the Autumn

out-door feeding should not be carried on later than September, and if the supply can be kept warm all the time, it will be a decided advantage. No more bees will then be lost than are old and that will be quite useless, and in any case would hardly live to help winter their colony, while the stores are arranged in the best possible position, and sufficient young bees are brought into existence to place the hives in good condition for Winter.

It is many years since I first practised this kind of feeding, and having tried nearly every way that could be thought of, I have found the

Most Suitable Feeders for the Purpose

to be large glass or other jars, with porous cloths tied over the mouths, and inverted. Any number of these can be used, turning them down over boards with circular openings cut out, that they may be held in a suspended position. Float feeders and other similar arrangements for out-door use are sure to go wrong, causing many deaths, but with the above all is clean, there can be no daubing, and empty jars can soon be replaced by others,

or the whole quickly cleared away should any cause arise for so doing.

Feeding by Syrup-filled Combs in Spring

is another process which requires a degree of caution in carrying out, such as few are aware of. The excitement caused by introducing whole combs of unsealed food before a younger element of life has been created, causes unnecessary flights with its consequently increased death rate among the older inhabitants of the hive.

Making Syrup.

In making syrup over the fire, the operator frequently boils it too long after all the lumps are melted. This gets rid of too much moisture, and the food ultimately granulates in the combs.

The best way is not to boil a minute longer than is required to reduce all the sugar to syrup. It is hardly necessary to boil at all, if the sugar is first put in the vessel and boiling water then poured over it, when constant stirring will soon reduce the whole.

For Autumn use the usual proportion is one pound of sugar to half-a-pint of water. In Spring one-fifth more water may be used, and this thin syrup is much required by the bees from the end of February, as it prevents a great waste of adult bees, in that they have no need to fly for water, as they otherwise would.

Cane *versus* Beet Sugar.

There is probably no jam now made, or marmalade for that matter, with pure cane sugar. Not only is beet sugar used, but generally a poor quality at that, with the addition of "glucose" to give it "body," or that firmness so well known in bought jams.

Cane sugar in cubes is always quoted at a shilling or two

per cwt. more than the best beet cubes, but the latter will be found quite suitable for bee-feeding. Cane sugar is so marked or described, when offered in cases or bags, and *that which is not so branded is beet sugar.*

It is more difficult to distinguish between the moist sugars, except that the beets are less sweet, and bees will not touch these inferior grades either as syrup or when offered dry. It is these low grades of "refined sugar only," which give many jams that dark muddy appearance. It may not be generally known that good moist sugars make the softest cakes; while of course honey is still better in that respect.

Fine crystallized sugar, whether from cane or beets, is unsuitable for making syrup, while the buyer in procuring such has no guarantee that he is obtaining cane sugar.

Although chemists find that sugar-syrup is converted by the bees into what is practically honey—by certain manipulation and additions—making it a correct food for sustaining insect life; it does not by any means follow that sugar-fed honey is to be, or can be sold as flower honey.

Original cane sugar as expressed from the plant, is a perfect life sustaining food in itself, but the refining processes eradicate the color and primary odor, which the bees cannot replace.

No intending purchaser should procure Bees or Queens without a guarantee that they are free from disease. Many disastrous failures have occurred where this precaution has been neglected.

All Stocks, Swarms or Driven Bees should be fed upon medicated food for some days after arrival; and should certainly be placed in hives previously dressed with some well-known powerful antiseptic preparation.

CHAPTER XXIII.

BUYING, PACKING, AND MOVING BEES.

MUCH has already been explained as to the best time to buy bees. If possible, they should be obtained in hives that are in general use, and can be adapted to modern management. In most cases the seller packs the bees and delivers them to the rail, the buyer paying carriage; but where many hives are concerned the buyer will find it greatly to his advantage to see them packed and delivered to the railway company.

Combs Inverted for Travelling.

Where stocks are sent long distances by rail or otherwise, the hive and combs should be inverted, as the combs then ride more securely, having their base resting upon the top bar of the inverted frame. Tapes may or may not be fastened round the frames to enclose the combs more securely; but to dispense with this, where I can make my own selection, I use combs that are well fastened down the side bars of the frame, as well as being strongly wired.

Shade must be provided in hot weather, with more ventilation than at other times. Bees are lost more from

want of ventilation in travelling than from any other reason, and due provision should be made according to the number of occupants in the receptacle which may be provided. If sacking can be arranged to give shade and at the same time exclude light without interfering with the admission of air, bees will travel and stand confinement very much better than where they are continually striving to get out, and thus to a great extent impeding free circulation of air.

Packing Stocks.

Before inverting the hive, fasten a thin board along the whole length of the hives at the ends of the frames, overlapping these at least one inch. A piece of porous sacking is first to be placed above the frames and held in position by a few tacks till the slips of wood are fixed. With the left hand find where the frame ends come, and with a bradawl bore a hole through the thin board into each bar; then insert French nails *pressed* not quite home. Screws are to be used with this exception, as little hammering should be allowed for fear of injuring the comb attachments.

We have to provide for a free circulation of air under, after the hive is inverted; therefore on each upper side, parallel with the frames, thick strips of wood are to be screwed, so that these only will rest on the ground when turned over. The entrance may be closed with perforated zinc before or after as is most convenient. The packing can take place several days before moving, if desired, leaving only the entrance to be closed on the eve of departure. In very hot weather for long journeys additional ventilation should be provided by holes bored at the sides and covered inside with perforated material, or an additional storey or half-storey can be given under the other before inversion.

By inverting the combs we not only place their weight upon, instead of depending from their base, but also provide that there is free circulation of air throughout the hive above them; whereas in the natural position the heated air ascending is unable to escape and tends to weaken the foundation of the combs.

Straw Skeps

containing stocks should be very carefully treated, when railing a long distance. The skep, after slight smoking, is gently turned over on to its crown, a stick, one inch thick, is placed across all the combs, and slightly pressed down. A piece of sacking is tied over the whole, and the skep set with its crown into a common cheese box, or any other receptacle that will keep it from rolling, and all is secured as one parcel with strong string or a cord. The stick prevents suffocation by holding the cloth away from the combs, and also prevents the latter from falling to one side.

When Delivered on Rail,

or placed in vans, the combs should always travel in a line parallel with the road, so that with any incline, or sudden movement, they are not thrown to one side. When necessary to tier up the hives, place boards between each set. Plenty of straw is needed to give them an easy motion, but on no account is it to be arranged so that the inverted hives rest directly upon it, though some must be packed between to prevent sliding, or jolting against each other. Place a good layer first upon the floor, spread it out evenly, and then lay boards down; on these place the first set of hives; then straw and boards again, thus always keeping a clear space under the sacking next the frames.

All covers and odd material must be packed separately, and where the stock hives are simple square boxes, with

no projection whatever, the entire process will be more satisfactory and expeditious.

For Export,

additional care will be necessary, while a sponge must be provided at one side in a perforated box, with directions requesting that the same may be moistened occasionally; or a zinc vessel may be supplied with a cotton wick held in a funnel reaching nearly to the bottom that the water cannot be spilled.

It may be necessary, according to the strength of the colony, to give an outer case, thoroughly ventilated to provide for excessive heat; though when it is known that bees have to undergo a high temperature, a nucleus only will travel far better and give more satisfactory results than a full colony.

On Receipt of the Bees,

they should be placed out where they are to stand permanently. The packing need not be removed for a day or so, but the entrances are to be opened as soon as the bees are a little quiet. Do not liberate each hive in rotation, but go from one spot to another as far distant as possible, and so let the first quiet down before a neighbouring hive is opened.

It is well not to examine the interior of the hives until the bees have first noted their location; but it will then be necessary to determine if any queens have been lost, which frequently is the case. Where any are missing it will be desirable to unite to others at once if this happens to be the first venture of the apiarist; but when other colonies are on hand one may be able to insert another rather than unite.

Moving Bees Short Distances.

I am frequently asked how it is possible to move bees

only a few hundred yards from their old location. Of course it is a very easy matter to shift them only a few yards by easy stages, while actively flying, but in the above case when they cannot be moved in Winter, it will be necessary to make artificial swarms from them ; uniting two swarms with one queen, and then uniting the two deprived stocks with the other queen. Thus the united old stocks can be moved at once to their destination ; and on the second evening the double swarm may also be moved, but this should go into a cellar or other darkened room until another two or three days, and set out towards evening, with a board reaching partly over the entrance.

An alternative plan which would not work quite so well, would be to move the stock towards evening, and when in position, shake all the bees from the combs on to a wide board reaching up to the entrance. Bees treated like this will often stay like a new swarm.

Packing Queens.

An admixture of honey and sugar, first mentioned in Rev. L. L. Langstroth's book as a substitute for honey in wintering, was afterwards used by Mr. I. R. Good, another American, in queen cages when transmitted by the post. However, perfection had yet to come ; the food was right, the candy was "good," but until the introduction of F. Benton's mailing cage, general success was not attained. Queens may now be sent by post just as safely as an ordinary letter, and Benton's cage has rendered the system absolutely perfect for moderate distances.

The Benton Cage

consists of three compartments; one is ventilated for general accommodation, and particularly for advantage to the bees under high temperatures ; from this a small passage communicates with the central compartment,

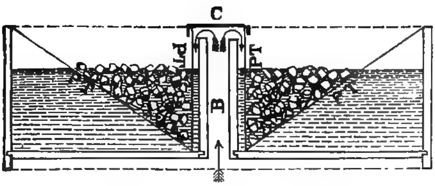


FIG. 73.

Sectional View of Simmins' Self-acting Syrup Feeders (1883).
Non-cooking hot or cold process.
PT Perforated Strainer.

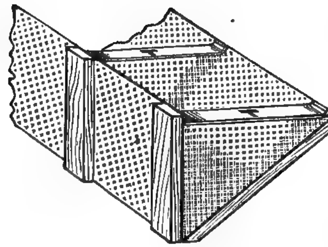


FIG. 74.

Enlarged View of the Perforated Strainer for holding Sugar.

This Feeder is made the full dimensions of the Hive in use, and it is used with no quilt or crown board between. It is invaluable for distant or out-apiaries.

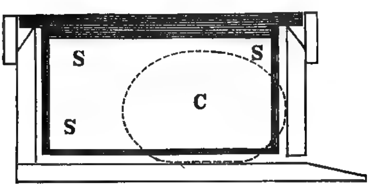


FIG. 75.

Standard Frame, shewing position of stores and cluster at fore-part of Winter.

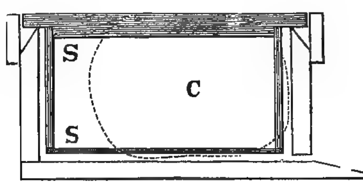


FIG. 76.

Ditto at approach of Spring in shallow Standard or Langstroth Frame.

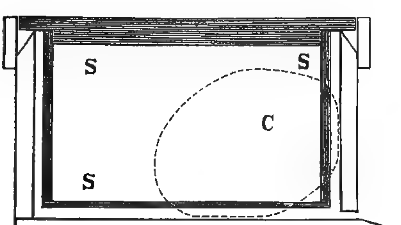


FIG. 77.

Commercial Standard, shewing position of stores and cluster at fore-part of Winter.

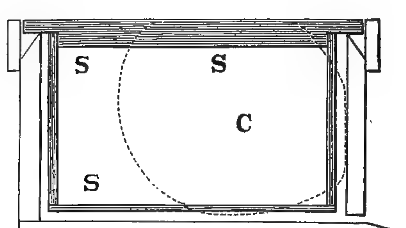


FIG. 78.

Ditto at approach of Spring.

otherwise having no ventilation. The last has another small opening leading into the third space wherein is

The Food,

which is made by thoroughly incorporating with finely powdered loaf sugur just sufficient liquid honey to form a thick paste; this should be almost dry, and give no sign of "running" under any temperature.

It is best made up some time before actually required for use, so that any excess of moisture may descend, leaving the upper portion just right for the cages. When the compartment is filled a sheet of wax or a piece of parchment covers the opening, while a thin lid of wood fits over the whole, being secured with brads or tacks. (See Fig. 67.) For long journeys abroad duplicate compartments are needed, with also a few more bees.

Cooked and Medicated Food.

The Author has for many years heated the honey for some hours (first adding a little water), and medicated the mixture used in his queen-mailing cages, even though assured in his own mind the honey may be quite free from any germs of disease.

Mail Candy without Honey.

Mr. Fuller, an American queen-breeder, claims to have perfected the making of mail-cage candy without the use of honey. He got the idea from the "Old Country," as also the method of applying candy in glass covered boxes over stocks when short of food.

His revised composition for this candy is as follows:—Graulated sugar, 5 lbs.; coffee A sugar, 1 lb.; glucose, 1 lb.; water, 1½ pints; one teaspoonful of cream tartar. Boil, but do not stir until at 240° F. Stir quickly when cooling, and pour out.

American friends are anticipating great benefit in wintering bees on this candy; but any wholesale attempt to set up a substitute for properly stored combs will only result in disaster where long periods of cold weather are the rule.

Inserting the Bees.

The lid is first to be tacked on only at one corner, at the side of the food compartment. Hold the cage in the left hand with the thumb on the lid just above the ventilated chamber, and now pick from the combs about a dozen young bees with the right hand, inserting them one at a time while the thumb moves the lid back to receive each in its turn. The queen is to be put in last to make sure of no mistake, when the remainder of the tacks can be driven in.

If the weather is cold more bees must accompany the queen, and additional warmth may be given by outside packing. Instead of the brad holes I have found a sawcut through the end more effective for ventilating in hot weather; indeed, I originated this plan and have used no other means of giving air, considering the small holes quite inadequate.

Packing Swarms.

A "rough-and-ready" way is to tie a piece of strainer cloth over the mouth of a skep in which the swarm may have been taken; but for long distances something more substantial is necessary, and a frame of honey will be required.

The box must be as light as is possible consistent with strength, and ventilation should be given on at least two opposite sides. I have had very good results with air space all round the top, the lid being raised and secured to the main body with perforated zinc.

Swarms should always be purchased by weight, and the buyer ought to insist upon receiving no other. There are 3,500 bees to the pound, and four or five pounds would give a good working swarm. The plan of offering swarms containing so many thousand bees, when in reality not more than a third of the number make up the swarm forwarded, is becoming a thing of the past, and I do not suppose many would be caught in the trap now; nevertheless, swarms of no guaranteed weight are still advertised, and it is time bee-keepers set their faces against the practice.

Weighing Bees.

Where natural or other swarms are weighed after clustering inside the travelling box, they can be first secured and carried to the scales, and the weight marked upon the label. If they have to go a long journey, either place a feeding bottle over the zinc until starting or see that a frame with sufficient sealed stores is fixed in before the swarm is hived; the weight of such comb and the box to be noted, and presently deducted from the gross weight.

Where a definite quantity is ordered, the scales are to be carried to the hive by any convenient arrangement that provides correct balance; take the weight of the package, and if the opening is not wide enough to admit a comb end-way, use a funnel lined with zinc. Now make sure of the queen and then shake from the combs the necessary quantity of bees, and insert the queen last of all; close at once and pack for the journey.

They are to be first smoked in the usual way, and all the time they do not miss the queen, the bulk of the bees shot into the box will remain simply clustering on the sides. The operation should take place early in the morning or towards evening as the bees are more restful,

and they can be put up in less time as there are more at home. Give food if necessary as before.

I consider the most satisfactory way and the more profitable to the purchaser when wishing to establish a stock of any new variety is to get them in

Three-Frame Nuclei ;

but I do not mean such as are often sent out, and as some I have myself received from abroad with not enough bees to cover one of the frames ; but such as can be built up with little trouble by the purchaser.

To make up a fair nucleus of three frames, take from a strong hive all the bees from one comb, and one comb full of brood where young bees are rapidly coming forth, with all the bees thereon. Place the brood comb at the centre of the small hive, the other bees having first been shaken in, and look up a comb partly stored to place on each side. Screw the lid down after inserting the queen ; place wire nails through into the frames at each end, and invert as for full stocks. Strong combs should be selected, and sufficient ventilation given without danger of chilling the brood.

The frame of hatching brood will presently give enough bees to cover three combs, so that with the other bees a queen gets a good start, though if the apiarist has them to spare, another comb of brood in like condition added every seven days will do wonders in building up a full colony.

Standard Colonies

of definite quantities are now offered for sale, and are far more reliable than stocks bought in the old "hap-hazard" kind of way. For so many combs offered, one may rely upon having that number covered with bees, and all except the two outer combs pretty well filled with brood. Thus a six-frame stock should have four frames of brood, an

eight-frame six of brood, and so on. These may frequently be supered within a week or ten days after receipt.

Feeding Nuclei and Stocks.

Unless good honey weather is in evidence these should be carefully fed upon arrival; and on no account should the brood be spread; as this may not only prove a hindrance, but will often be the cause of ruin. Additional combs or foundation may be safely added on either side.

No apiary of any pretensions can be properly conducted without a suitable house, so that the surplus honey may be accommodated ; extracting carried out under cover ; and queen-rearing operations be free from exposure.

CHAPTER XXIV.

HOUSE APIARIES, STORE ROOMS, &c.

IT would be a difficult matter to give hard and fast rules for putting up buildings to suit every bee-keeper who owns a large number of colonies. One may have premises that with little or no alteration suit his requirements. Another may have no room to put up convenient sheds, or the situation is such that any given plan could not be carried out.

I will therefore give ground plans of buildings, etc., which I have found to be convenient, and the reader may then make such modifications as may suit his own particular requirements, having the general idea in mind.

The Building

as Fig. 79, is put up with 3-in. by 2-in. scantling as the framework, and $\frac{3}{4}$-in. by 6-in. boards, matched and beaded. The roof leans to a 10-ft. wall at the back. The front of the main shed is 6ft. from ground to roof ; the outer store about 4ft. at the front.

The Workshop

is 20ft. by 12ft., with communication to the apiary at D. The plan, to a great extent, explains itself ; F R are frame-racks for hanging up frames as put together, or

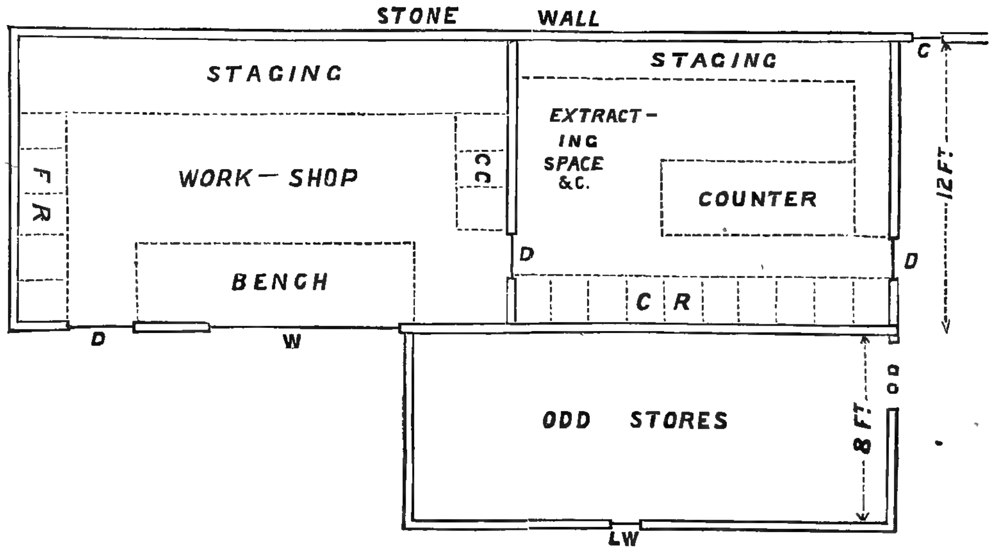


FIG. 79.—Plan of Workshop and Store Rooms.

foundation when inserted ready for use. **C C** are closed comb-cupboards, with ventilation through the hinged doors at both top and bottom by auger holes covered with perforated zinc. The bench stands in front of

The Window,

the panes of which are in one piece, and *do not reach the bottom of the frame* by ½in.; thus, when combs are first taken into the workroom any stray bees soon find their way out, as also at any time. To prevent them returning, perforated zinc is tacked outside along the bottom of the frame, and reaching 6in. or 7in. above the said opening, with a space of ⅜in. between it and the glass. The above arrangement with fixed windows I prefer to any revolving sash, because a room may be left for days together, and the bee-keeper knows that not a bee will lose its life in the vain endeavor to escape, as with the other which needs constant attention to prevent much loss. "Why not have the opening at the top of the glass?" is a frequent query. Simply because in practice it does not answer. The bees get tired before reaching the top, and if there is a draught they at once fall back.

From the workshop we pass into the

Honey Room,

where by the passage from end to end the recess is occupied by frame-racks which will accommodate several thousand frames, empty combs, or those stored brought in from the apiary for extracting. At the other side of the passage we see the counter; with staging on two sides near that, where crates of both bottled and comb-honey can be stored.

The open space gives room for extracting, arranged with or without a stage to assist in drawing from the extractor, as the apiarist may desire. Passing the outer

door, D, we again look upon a portion of the apiary, with the gateway G leading out of the premises. O D is an open doorway to the store for odd materials, timber, &c. The latter may be placed overhead in the workshop for greater convenience. L W is a latticed window, giving all the light required besides the open doorway. The honey room is lighted by a window in the roof, having no arrangement for clearing out bees as this is done in the workrooms before our honey is taken in, and every care is taken to keep out any intruder, while at the same time a thorough change of air is provided.

The floor of the honey room must be concreted, but the other is not of so much importance. It is sometimes recommended that a paraffin stove be kept burning in the honey store, but with the skylight sufficiently large, the heat of the sun will be quite enough to complete the ripening process, taking care that it does not shine directly upon the honey.

A COVERED APIARY,

as seen by ground plan illustrated (Fig. 80), for 150 colonies, occupies a space 118ft. by 50ft., being compactly built with the entrances arranged so that no two are alike within several yards. The base of all the walls is a plank, 6in. by 3in., under which is laid a single row of 3-in. bricks as with the building first mentioned. All the framework is of 4-in. by 2-in. scantling and matched boards as before, put on when dry. The only door communicating with the outside leads first into a closed room, 50ft. by 12ft. Just beyond the centre we have the honey safe and extracting room, which stands 2ft. clear of the ground with woven wire on two sides opposite the window. Steps lead to the door, which is carefully fitted, and no bees are able to get in.

The long room has two windows also with the glass arranged that no bees are ever found dead inside, as before mentioned. Stray bees are here disposed of before the honey goes into the safe. Between the latter and the outer door stands a table, 12ft. by 3ft. for general manipulations. On either side with intervening passages are shelves for storing crates and other materials.

The larger shed has a span roof, 10ft. high at the centre, dropping to 8ft. at the sides, and upon turning to the right after entering by the outer door, we can pass into either of the parallel bee sheds, each of which is 8ft. high, dropping to 5ft. on the lower wall. The hives are situated all along inside the south wall, with flight holes cut through, and the outside of the same varied in appearance. Here no glass is used, but shutters provided at suitable intervals.

The Advantages

that can be claimed for a covered apiary are as follows:—The bees as well as the master have shade during the heat of the day at the season most attention is required. Shelter is afforded from wind and rain, so that any necessary work is carried on without hindrance; and lastly the entire arrangement provides for a great saving of time in that all is compactly arranged in the smallest convenient space.

Provision is made for 150 colonies, and nuclei can be placed in narrow hives close to the walls about 4ft. from the ground, resting on the central rail of the frame-work.

Bee-houses so-called,

but being merely cupboards, with two or more rows of hives, leaving neither room for tiering nor ordinary manipulations, are not worthy a place in the modern

apiary; moreover, no arrangement in larger houses can be in any sense convenient where an attempt is made to arrange an upper and lower row of standard hives.

For the production of honey, only a single row is possible, where the supers have to be tiered up.

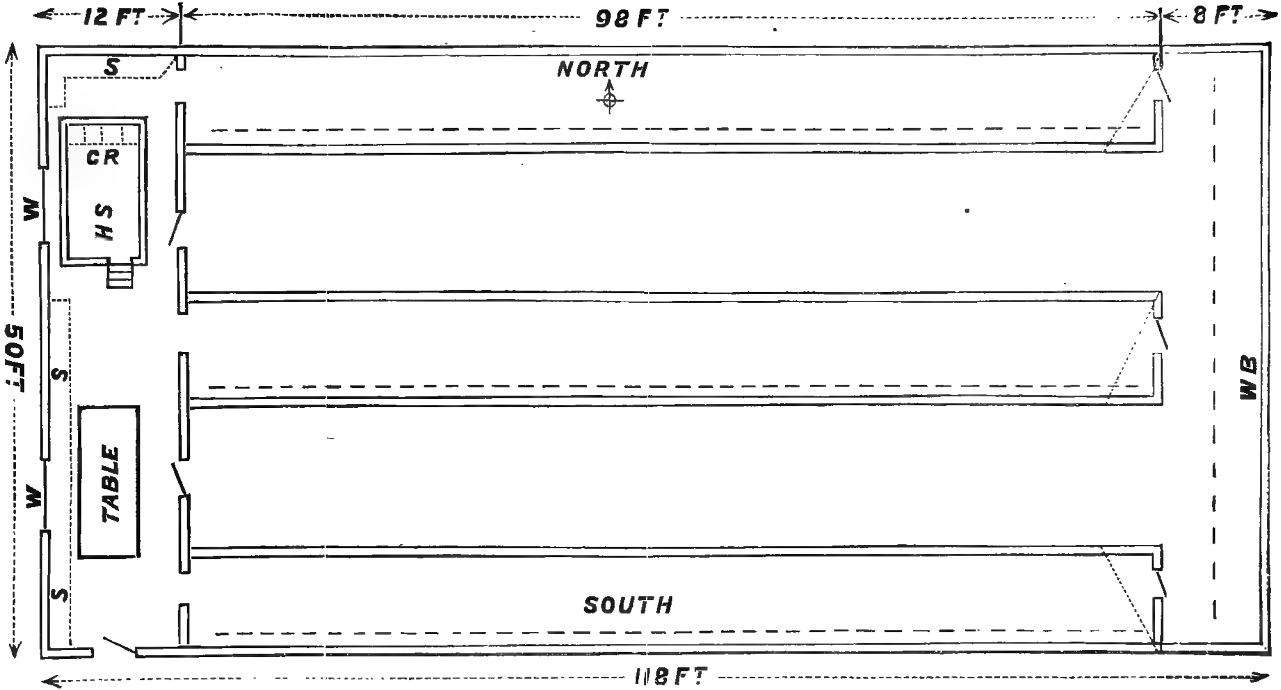


FIG. 80.—Ground Plan of Covered Apiary.

W Windows. **S** Shelves or Staging. **H S** Honey Safe, Extracting Room and Store Room.
C R Comb Racks. — Position of Hives. **W B** Wind Break.

The Secretion of Wax is carried on by the workers to the fullest extent during a flow of honey, particularly after swarming; as well as at such periods as artificial feeding is found necessary.

If there is no income there can be little or no secretion of wax. One pound of wax represents an expenditure of something over six pounds of honey. Unrefined cane sugar will yield more wax than can be secreted from honey.

CHAPTER XXV.

THE PRODUCTION OF WAX;

AND ECONOMIC USE OF FOUNDATION.

IT is probable that during a good honey flow wax may be produced by the bees in excess of their current needs, and thus largely wasted, particularly where the owner is negligent in not allowing sufficient surplus room for the development of additional combs.

The Author has seen myriads of fine wax scales scattered like chaff into the air where a strong swarm recently hived has been disturbed. The bulk of these scales appeared to rise from the floor, although it is possible that others may have been prematurely dislocated from the wax pockets because of the sudden excitement and fanning set up.

It will be realized that only the most vigorous and active honey gatherers would present such an object lesson as the foregoing. A great part of the refuse accumulating on the floor of a hive is pure wax, much of this being carried out deliberately or during the act of ventilation. And what becomes of the cappings removed from the winter stores?

One can only realize that they are ultimately wasted like the virgin wax scales produced in excess, and help further to litter the floor.

The more one studies the matter the more is he convinced that wax should be a profitable product of the apiary. Bee-keepers had been told over and over again that the bees consume 20 lbs. of honey while producing 1 lb. of wax therefrom; but on the face of it the idea was merely theoretical. An article costing, if we say only 5s. (20 lbs. of honey at 3d.) could not be sold for 1s. 6d. Supply and demand regulate prices, and it will be shown herein that the market value was, after all, the best test as to the cost of producing it.

Practical and Definite Conclusion.

I built a frame house, 50ft. long by 10ft. wide, and covered it with calico, so that the bees could not get out and would only fly in that space. There were several important factors to be considered; the bees experimented with had access to both water and pollen, but no brood was allowed at the time. The experiment was carried out where the bees were not confined to the hive, and they could gather no other food than that supplied to them for the purpose. A test of this kind should be carried out under a high temperature, and a fair swarm used for the occasion, but in my own case I had to be content with rather a low temperature, but the result was very satisfactory, and I found that no more than 6½ lbs. of honey are required in the production of a pound of wax.

Aids to Production.

The apiarist who has all the colonies and all the combs he requires is the one who will make the production of wax profitable. He will have a great deal from cappings in extracting, and many an odd piece, all of which should be

placed in some convenient receptacle till enough is obtained to run down. There are the queen cells even; shavings from combs when reduced to brood thickness in Spring; also the scrapings from the tops of frames, not including the propolis.

Then, again, new worker combs can be produced in Spring between the others containing brood, while feeding dry sugar or candy, at a great saving over foundation; the apiarist then being able to run down his more irregular combs or those that are getting too old; or, as is sometimes the case, the wax being perished, such would only be torn down by the bees, as they do not appreciate combs that have been out of use for a whole season. If possible all should be passed through the hive every year to keep them in good order.

During the season that bees are storing heavily I have reason to believe that the secretion of wax is continually going on, and if the scales cannot be utilized they are allowed to drop and be carried out as so much refuse. Now the space allowed by my system below the brood chamber provides that full employment shall ever be given should it happen from any cause that the supers are not removed in due time and the bees there kept busy. Thus we have another step towards the production of wax. When one desires

To Produce Wax in Quantity,

which can only be done when natural stores are plentiful, a colony must be run for extracted honey, and at suitable intervals alternate the combs of brood or stores with starters only in the frames. Between the stored combs these would be built rather thin, but the sealed combs are to be removed and the honey extracted as soon as the new ones are built to about two-thirds of the frame capacity; other empty frames take their place, and so on in rotation.

This process cannot be carried out to any extent between brood combs, except as described for spring work or when a young queen presides over the colony, otherwise some drone comb will be built; and the production of useless drones shows a great defect in management.

Another plan, more suitable for hot countries, by which a large number of colonies can be kept and much wax produced at little expense of labour, is to place several chambers fitted up with starters under the brood nest early in May. The bees will gradually work down, and the production of brood will be regulated in accordance with the amount of income, and no trouble with swarming will be experienced. Any old queens should be replaced by young ones reared in nuclei at one side.

Crowded Nuclei for Comb Building.

The most economical plan for producing even and useful worker combs is that of arranging small colonies of three or four combs with vigorous bees and queen. Shift about occasionally, making nuclei on the old stand to dispose of the older bees and so prevent the clogging of combs with honey. Keep all closed up warm and feed carefully if no store is coming in. Put in a frame with narrow guide only, and in three or four days such colonies will produce a beautiful worker comb nearly filling the frame and generally being crowded with eggs. These may be utilized as required, and the same process continued. For three months at a stretch such small (carefully tended) colonies will continue the process, giving something like two dozen good combs, while the brood removed will represent two powerful stocks. Such a profit, and saving of outlay in foundation, should satisfy the most economic bee-keeper.

The Production of All-Worker Combs

is assured where all young bees are retained, hence the

reason for shifting the nucleus occasionally. In that case a young queen is not an absolute necessity, unless the other begins to fail. Where swarms have been hived upon starters, I have avoided the building of drone combs by placing the frames rather less than $1\frac{3}{8}$in. from centre to centre. This point appears to have been overlooked by many who have been troubled in that direction.

Pollen Stored in the Sections.

This trouble I learned to avoid when hiving swarms upon full sheets of foundation in my endeavor to get the best work started in the sections. Just as I hived swarms upon foundation (when made by division), I also put them upon starters, with the addition of two combs of brood ; one with uncapped larvæ, and the other having brood hatching. Thus the bees have room to store the pollen carried the first day or two, without spoiling the partly finished sections when they happen to be removed from the old stock to the swarm ; and what is of equal importance, there is just sufficient brood to make up for wear and tear before a general hatching would otherwise take place. Moreover, the queen is kept below without the useless and expensive addition of excluder zinc generally used where starters are given under the sections.

When Swarming,

the plan is not to throw the bees entirely into the sections as soon as they are hived, but simply to prevent the production of an excess of brood in the height of the season, and with the two combs of brood so arranged the colony is worth wintering after the season is over ; whereas in the other case several have to be united to get a fair stock.

When Hiving on Starters

the brood combs may, however, be dispensed with if the

supers are not put on (with drawn combs) until the third day after making the swarm.

In tropical localities where the bees may crowd out the queen and refuse to store above the stock in consequence I can conceive of no better way than that of keeping them working on starters. This ensures profit in wax, a constant succession of brood, and larger honey yields.

All the above has reference to the profitable production of wax, and I shall be excused for bringing these particulars of management in here, more particularly as the whole question has received but little attention from bee-keepers generally.

When Foundation may be used to advantage.

Now I do not consider that foundation is always used in the stock chamber at a loss; in fact it can be adopted at considerable profit when extension of stock is the object.

A bee-keeper may wish to largely increase his stock of both bees and combs, and then considerable time will be gained by taking advantage of foundation; though it should be borne in mind that increase is obtained at the expense of honey, unless the stocks are very early.

When the honey season arrives we have to be prepared with plenty of storage room, and therefore nothing less than full sheets of foundation can be tolerated in our sections, while if already drawn out in preparation for the harvest, the results will be far better. If suitable foundation with a thin base is used there will be no difference to be distinguished between such combs and those built from starters only, while the appearance of the surface when capped will be much better than of those so often finished off with drone cells.

While the profitable production of wax will be carried out by those who have completed their stock, much will

depend upon locality, as well as the culture of bees most suited to the purpose.

Wax Extractors.

Solar wax extractors are frequently used, with a large surface of glass, on a frame; all being air-tight, enclosing a perforated vessel to take the wax and a pan under, but these are not so satisfactory as those worked by steam. A cross section of a suitable wax refiner is shown in two sections. A piece of fine flannel should be stretched across, under the perforated comb holder **A**, thus thoroughly refining at the first operation. The wax running on to the false bottom passes out by the spout into a convenient receptacle. When it is required to work from a steam boiler, the steam pipe should enter just above the water line shown, and no water will be required below, as when placed over a stove. The wax will be of still finer quality if the vessel it runs into contains warm water.

The illustration is that of the late Mr. Cheshire's pattern, and is manufactured by Mr. Meadows, of Syston. (See Fig. 69.)

Cost of Producing Wax.

My experiment was conducted during the Autumn of 1886 in a large flight room, 50ft. by 10ft. A swarm of nearly 3 lbs. weight was made up and given eight frames, with a slight line of wax as a starter to each. I determined to avoid the complication that would arise if brood were produced, but at the same time it was necessary to have a fertile queen presiding, or the bees would not work to the best advantage. The new combs were therefore removed every three days, and though occasionally eggs were to be seen, no food was consumed in their production other than that fed to the queen. The removed combs were placed behind the division board, and were emptied of their

contents by the bees, to be again used in building new combs.

Thus, without extracting, the combs were taken away perfectly dry, with the exception of the three last built, and to make sure of wasting none of this remaining honey the combs containing it were run down in a vessel with no added water. The bees had access to both pollen and water while building, and from 6 lbs. of honey fed to them they gave $6\frac{1}{4}$ ozs. of clear wax, with a balance of 15 ozs. of honey left over. If I say an even pound left I shall be nearer the mark, as the bees had the means of loading themselves much more heavily than when the swarm was made, as they were then forced to consume what they had before commencing to build. Five pounds, therefore, giving that quantity of wax, it would be supposed that it takes $12\frac{4}{5}$ lbs. of honey to yield a pound. But our experiment is not yet completed; the bees had to live during the 20 days taken to carry it out. Being in a confined area during Autumn when the weather was far from being as warm as could be desired, the expense of production would be very much more than when new combs are built in the height of the season. The bees did not get on so fast, especially as the best combs were removed in time to prevent the production of brood, and towards the last the supply of honey became very limited.

To get at the Cost of Living,

after removing the last of the combs and balance of the honey, the bees were given just 1 lb. of honey in a feeder arranged so that they would not get it fast enough to go on building. After the fourth day there were 6 ozs. left; but here is a little difficulty; they could not require 10 ozs. in that time, and on removing the feeder with balance of honey, and giving four empty combs they put about

2 ozs. into the cells. This would still leave 8 ozs. consumed, or 2 ozs. per day while in active flight. Then for the 20 days we have 40 ozs. consumed to preserve life, which deducted from the 5 lbs. leaves 2 lbs. 8 ozs. actually used in producing the $6\frac{1}{4}$ ozs. of wax; thus, to produce 1 lb. of wax $6\frac{2}{5}$ lbs. of honey would be consumed. When the cost of living was carried out the bees were reduced about one-third, so that 2 ozs. per day should be within the mark. In the height of the season with everything favorable it is only reasonable to say that the cost of production is really much less, and probably less than 5 lbs. of honey are consumed in actually producing one pound of wax under natural conditions.

Comparative Cost.

In the course of the experiment I found that about eight standard frames (14in. by $8\frac{1}{2}$in.) of new comb will give one pound of refined wax. It is surprising what a large amount of refuse is left after melting the most beautifully white combs, so that the actual weight of wax obtained is much less than that of the original combs. *Observe this:* one pound of wax, costing the producer less than 1s. 6d., fills eight frames with finished comb. To do this with foundation it will cost, in hard cash, 2s. 6d. for the base only; to this the bees add considerable of their own production before the combs can be completed; making the total cost much over 3s. Facts are stubborn things which cannot be ignored, and the bee-keeper will do well to consider if it is better to produce wax by saving the cost of brood foundation rather than attempt to make his bees manufacture it for sale, though the latter might very well be done in tropical regions, or even some other localities where Nature's bounteous hand provides honey by the scores of tons, and the market value of it is but small.

With honey yields that occur in Autumn on the heather-clad moors and hill sides of the north ; or the heavy flow of nectar occurring during the cooler season of the tropics ; or any other late yield ; the largest results can only be obtained where young queens have been fertilised and introduced to the stocks some three weeks prior to the expected harvest.

CHAPTER XXVI.

MANAGEMENT FOR LATE YIELDS.

THE HEATHER HARVEST ; CONDITIONS IN TROPICAL CLIMATES.

HAVING had considerable experience in former years, between 1870 and 1880, in sending my bees every Autumn to extensive heath-lands, and for some years also having an apiary in the midst of hundreds of acres of heather, the information placed before my readers in this chapter will doubtless prove of some value. Hitherto no work has given special treatment for the production of heather honey or other late yields; and yet this is a subject of the first importance to hundreds of bee-keepers, nearly all of whom wish for some better method than they have had for making the most of late harvests.

Our Scotch friends have not by any means a monopoly in heather resources. Many counties to the south, and the western isles have large areas of this honey plant ; but the honey secured in the north is considered to be better in quality.

Late in the season bees must be close to, or in the

midst of, the crop they are to gather from, and in the case of heather large quantities of honey can be, and often are, secured; but in very many instances the stock combs are totally blocked up with this valuable honey which the apiarist desires to get stored in the sections.

Heather honey being so thick, it is quite impossible to extract it unless removed as fast as gathered, and this is not desirable. It is usual for bees to crowd the stock combs late in the season, as many find to their cost; but why is it so? It is not that the nights are cooler, as frequently the temperature at night is much higher in August than during May, when bees work well in the supers. It is not solely that the bees are aware the season is drawing to a close; but if we would go to the very starting point of the trouble, we shall find that

The whole question centres upon the Queen,

as every bee-keeper may prove for himself, and as he will admit as he follows my statements.

Now, what is the condition of the colony which goes first into the supers in early Summer? Have I not already shown that the hive must be full of bees, and have every stock comb *literally crammed* with brood, when the honey *must* go into the sections? Well, why not do likewise for your heather crop? Imagine that you have another year, a new season coming in, instead of a late season in the same year; and then you will have your honey where you want it.

But, you say the bees will *not* breed to any extent late in the year. True, the same queen that you have used all the Summer will be of no use to you in this emergency, and just here is the point. You are, then, to

Use a Young Queen,*

and the best way to have one in readiness for every hive

* See also Simmins' Non-Swarming Pamphlet (Feb. 1886).

is to follow my plan of using every tenth colony for nuclei as already shown. Your first harvest probably closes towards the latter part of July, and as soon as the supers can be removed, dethrone the old queen and in due course unite the stock and nucleus. You now have a stronger colony and a young queen who will take good care that her domains are not crowded with honey. *Her* first season is just coming, and the bees will act accordingly.

This is a special case and special treatment is required, as the honey nearly always comes in so freely that, by the old method, the already exhausted queens are soon crowded out, and by the time the earlier harvest is over, the workers are also largely worn out; whereas with the young queen we have a good stock left, with bees still hatching to make up for the tremendous loss of life. More honey is accumulated because the population is larger and does not decrease as only too frequently has been the case.

Queenless Period—More Brood.

It is not generally realised that after a queenless period the bees, when again in possession of a young fertile queen, will be more determined to develop a large brood nest.* Hence the old queen may be removed some ten days before uniting with the nucleus and young queen.

Where young queens are not secured, or those used may not be very prolific, the number of brood combs must be restricted just before supering; and where swarms may not be set up on starters, the nearest equivalent is the use of a shallow brood chamber; but with these plans there is always a loss of stock, which rarely pays for the extra yield from late crops.

---

* An exception may occur where a late reared queen is given to a stock, and neither natural nor artificial food is obtainable, the young queen then waiting until the following Spring.

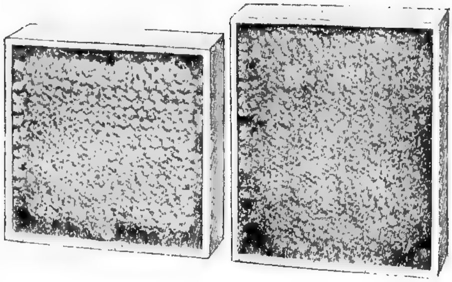


Fig. 81.
Comparison of Tall and Square Sections.
(After Root Co.)

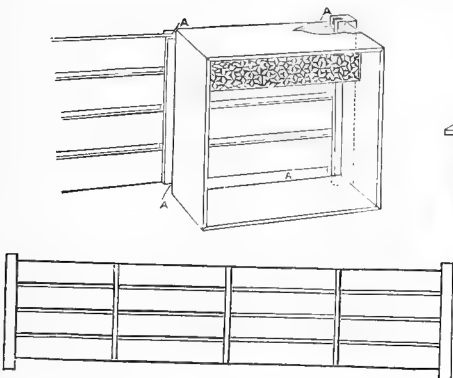


Fig. 82.
The Root Co.'s design of Fence Separator.

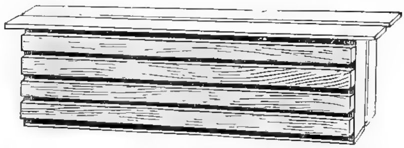


Fig. 83.
Simmins' Divided Section Holder with Slatted Divider on one side.

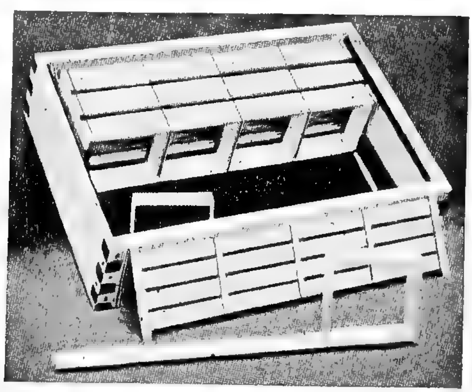


Fig. 84.
The Root Co.'s method of working sections.

Of course, only worked-out combs are to be used in the sections, including those not completed from the first harvest, after being cleared by the extractor. At the termination of the earlier harvest if any stores are left in broodless stock combs, the same may be extracted, and in

Uniting with the Nucleus,

only those combs most crowded with brood should be used. The odd combs of brood can be given to one or more lots left at home. Some reader may say that his hives *are* crowded when his bees go to the moors. They may be, but like the queen such bees are already exhausted by their previous labors, and new blood is required throughout if one wishes to make the most of this last important harvest.

If necessary feed "from hand to mouth" after uniting, until time for the heather, but on no account feed heavily, as once advised by a correspondent in the *British Bee Journal*, who hoped thereby to fill up the space the old queen could not occupy, expecting that the heather honey would all go above, and that when the bees came home they would require no more feeding. True indeed, for there would in many cases be no bees to require it.

Young Queens every Year.

My position in regard to this all-important item of rearing young queens every year, towards the Autumn, as first set out in my 1886 pamphlet, caused considerable comment at the time, but practical bee-keepers have since realised the necessity of following this method, as well as that of having the hives full of brood, such as can only be secured by such queens when preparing for a late harvest.

Tropical and Semi-Tropical Conditions.

There is often a peculiarity about the production of

honey in hot climates that is not so frequently met with in temperate zones. Queens bred from strains of bees acclimatized in temperate localities, producing workers in every way desirable for honey-production, may be comparative failures when transplanted to places near the Equator.

Ordinary Italians, Carniolans, or Black bees will be of little use ; but better results will be secured by using Cyprians or Holy Lands ; or the first crosses from these with Italian or Carniolan drones, where the situation is very carefully studied.

Crowding the Stock Combs.

Near the tropics bees may crowd the stock combs with stores to such an extent that the population is never sufficient to ensure the production of large yields, while all the time honey is wasting everywhere by the ton.* Then it is often said the bees are lazy ; but how about the owner?

But there are practical bee-keepers who are certainly not lazy, and who know that their bees are not lazy ; but they nevertheless have great difficulty in maintaining a brood nest, and without a succession of young bees no profitable result is to be gained.

In some instances the great difficulty is that the heaviest flow may occur just in the cooler season, when the bees naturally require a rest from brood rearing—and they take it. This does not prevent them gathering some of the honey that is everywhere available, until they have crowded the broodless combs.

No Brood—No Surplus Comb-Building.

If bees have no brood in the combs already covered they

* The very same thing happens occasionally through inattention in Great Britain, the United States, and elsewhere ; but not as a general climatic condition.

do not usually see the necessity of building further combs, nor do they then care to store in secondary chambers, hence the deadlock in a comparatively cool and late season.

As we have seen, the difficulty is one largely governed by the annual rest required by all Nature. Consequently a period of queenlessness should be allowed before adding the recently fertilized queen; and this period should be carefully judged that it may be just prior to the flow expected.

Swarming on Starters,

or narrow guides in the frames, with the young queen, will almost invariably ensure a compact brood nest, when the chambers with extracting combs, or sections in heather districts with drawn combs, may be placed above.

Why not Extract?

Yes, why not extract the honey from the heavily stored brood combs, instead of swarming on starters? Because the combs are largely clogged with pollen, and every available cell is again filled up with honey, but no brood. Extract by all means, but do not return the combs for several days after placing the bees on starters, when there will be a better opportunity of continuing the process to profitable advantage.

Cyprians and Holy Lands

naturally breed later than other varieties, and they are a desirable acquisition in apiaries where the troubles under consideration are experienced; but these bees are not suitable for comb-honey production unless crossed with Italians or Carniolans; and are certainly far better honey gatherers for extracting purposes when so crossed.

Doubled Stocks for Heather Work.

There is always the opportunity of uniting two colonies

before taking the bees to the moors, using all the bees of the two in one stock chamber, except for a few left at home on the combs containing least brood, with the spare queen.

By following this plan, the owner will have to pack and carry only half the number of stocks, while his yield of honey will in all probability be doubled or trebled.

Doubled Swarms on Starters.

Another plan is that of uniting all the available bees from any two adjoining hives, placing them on starters in the frames, and then doubling the swarmed combs, and remaining bees, with the spare queen, to be left at home. The latter may be helped to build up to useful stocks in the meantime, and so compensate for the loss of the adult bees used up at the heather, and which in any case would not have lived through the Winter. The remnants may be united upon their return.

Such swarms should be prepared the first week in August; the hive being well ventilated while travelling. All supers may be taken to their destination free from bees and arranged in position on arrival.

There is of course a risk of starvation * with these combless swarms when first set up, and if the weather does not become favorable they should be supplied with candy, which is the most convenient and reliable food for this season.

Driven Bees for the Heather.

Where these can be procured in time they may also be started on guides, placing two or three lots together, and supering three days after hiving them, with a supply of candy, or a little syrup; otherwise they may abscond.

---

* A similar mishap may occur five years out of six where a single colony is reduced to a shallow stock chamber for heather work.

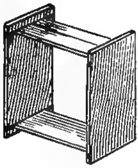


FIG. 85.

Simmins' Bee-Space Glass-rail Section. (1878).

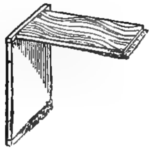


FIG. 86.

Simmins' 4-piece Section secured without nails.

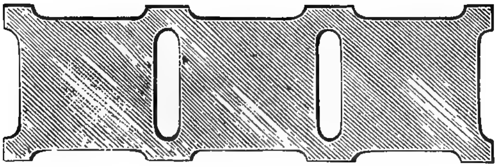


FIG. 87.

Slotted Separator.

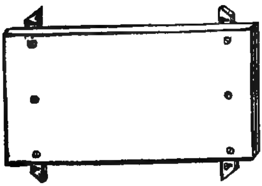


FIG. 88.

Foundation Guide and Wiring Block.

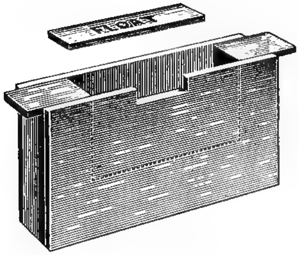


FIG. 89.

Small Feeder with Float, used as a dummy.

There is always a danger of contracting disease in procuring driven bees wholesale, as very many northern bee-men have found to their cost, and none should be purchased without a guarantee that they are free from any disease.

When Moving to the Heather,

everything should be got ready and loaded on the vans over-night, and if not desirable to travel during the night the journey ought not to be delayed later than 3 a.m. Upon reaching their destination the hives should be treated as before shown after a journey.

The Supers should Travel Separated

from the hives, and be arranged in position on the next day after the bees have been liberated, or on the same day, as soon as the bees are settled, if inconvenient to attend next day. Each stock should have an extra chamber for better ventilation, and all openings for the admission of air must be shaded, so that there may be as little excitement as possible to exhaust the bees.

Honey Presses

are much used by those obtaining heather honey, which as before stated, is so thick that the extractor is useless for removing it from the combs. At the same time it is desirable that old combs containing pollen and other extraneous matter should not be passed through the press, at least when the honey is intended for sale.

The Great Secret of Comb-honey Production.—Where the bee-owner strives to set up his supers with "Drawn Combs" (partly worked foundation of the current early season), his yields will be largely augmented.

The supers will be quickly occupied, and completed, while the stocks are more populous ; yet at the same time less inclined to swarm, as shown in the case of working for extracted honey with unlimited comb-space provided.—"*Simmins' Non-Swarming System*" and Comb-Honey Production, 1886.

CHAPTER XXVII.

DRAWN COMBS IN SECTIONS ;

AND THEIR SYSTEMATIC PRODUCTION FOR THE CURRENT SEASON.

IN the early 80's the Author experimented largely in the preparation of drawn foundation, or partly worked combs in the forepart of successive seasons, in preparation for the *current season's* comb-honey yield.

In 1886 he published the results of his experiments, and endeavored to get bee-keepers to realise that this process was the basis of larger comb-honey yields, while at the same time the supers were taken to more readily ; and in that more prepared comb space could be given at the start, he pointed out that swarming was largely checked. He also insisted that this plan was the basis of his Non-Swarming method as then published (1886) for working in connection with the production of comb-honey on a more extended scale.

The Author also showed that without contraction or crowding of the brood-nest—indeed with unlimited room

below the stock—bees would immediately take possession of several supers such as have first been *filled with newly built combs.**

Again quoting from the said early publication, we find: "Neither strips nor full sheets of foundation in sections "will induce the bees to work in them while so much room "is allowed below, and when one has once made up his "mind to start with nothing but comb, he will find it can "be done, and moreover, an immensely increased yield "will be secured thereby. The difference between using "foundation and ready-built combs in supers will represent "at least 30 lbs. in favor of the latter (per stock), as the "bees store all their surplus above from the very first, and "the brood nest is not cramped, as is frequently the case "where foundation is used" (in the sections).

In these original experiments the foundation was built out early above strong colonies which had a *dry feeder on either side* of some ten or eleven stock frames,† each with a full sheet of thin foundation that when partly drawn, would cut up exactly six section combs. In the same early work I illustrated the best form of gauging box for cutting the squares of drawn foundation to the exact size to fit firmly into each section, and the same engraving has been given in each edition of this work, together with the illustration of the most suitable form of comb cutter I had been able to use, being a taut saw blade as fine as a fret saw.

The Author's Original Completely Divided Sections and Holders.

But I was not content to continue with these methods,

* These italics are as given in the Author's 1886 pamphlet.

† Under the influence of this method of feeding, a moderately strong colony will expand to cover double the usual number of combs, hence the new combs are quickly drawn out.

and by 1889 had developed my completely divided sections, and section holders, which then disposed of the necessity of cutting out any combs after they had been partly drawn by the bees.

No Cutting to Fit in Sections.

As already illustrated and explained in this and former editions the foundation is attached to the *one side of the half frame and three half-sections fitted therein.* The shallow super crates are then placed over strong stocks and fed as before if early, and as soon as partly drawn, the *corresponding half frame and three halved sections* are simply pressed in place on the other side, thus making the complete set.

By this simple method one secures all the benefits of the new (current season's) drawn combs, with none of the former troublesome cutting of combs and fixing into each separate section.

The Author's Original (1886) Three-side-cut Sections.

The above refers to the $4\frac{1}{4}$in. by $4\frac{1}{4}$in. by 2in. completely divided sections, but now we use the 5in. by 4in. by $1\frac{1}{2}$in. tall section; this latter is simply split on the three sides, the plan first offered by the Author in 1886; and the tall section being no more than the ordinary comb thickness, can also be worked out in shallow supers, by special feeding and additional warmth, before the honey season opens.

Section Frames between Brood for 12 Hours.

The sets of halved frames and sections, with foundation attached, may be drawn very quickly when placed between brood—a few in each stock—towards evening, where feeding is carried on, and removing them next morning. The narrow sections may also be started in the same way where only a limited number are required.

Making a New Swarm Draw out its own Super Foundation.

Swarms are rarely made to store as much honey in sections as they should do, and yet when they are first hived they are always in the best possible condition for wax working.

The process to be followed is this :—Instead of giving a full set of stock frames in the first instance, whether they have combs or brood foundation, only half the usual number should be allowed to start with, and these intersected by narrow sections, or halved (2in.) sections in the twin holders. These are removed and exchanged for fresh sets, as fast as partly drawn, leaving them only a few hours as before.

As soon as sufficient drawn combs are secured to start two supers, the full complement of brood frames is made up and the two supers placed above.

No Full-depth Cells ; the Scent of the Hive.

I have repeatedly pointed out that there is nothing to be gained by waiting for full-depth cells to be worked before removal of the drawn combs. It would only result in loss of time and partly storing of food or honey not required in these raised cells.

Being partly worked, and the combs and sections once having the scent of the hive, further colonies, or the swarms as above, over which the drawn combs may be placed, will readily occupy them, and complete the work very rapidly.

Wholesale Production of Drawn Combs on the Advent of the Honey Flow.

If the reader will refer to page 305, he will see how he may secure a very large number of sections started with newly drawn combs as the season opens, and just when

populous stocks are in the pink of condition for work of this kind. But the apiarist must be lively and get the supers changed as rapidly as the work of a progressive stock will permit. A day lost in this direction may mean a complete super of comb honey missed later on.

Some American Friends 30 Years Behind.

Apart from the general practice of saving over unfinished section combs left from a previous harvest, as bait combs for the following season, the Author's early experiments and definite recommendations given in his pamphlet of 1886, marked the *first systematic process* of providing drawn combs for *all sections* prior to the current season's operations.

Our American friends during the Autumn of 1913, again started a discussion upon this question; and although my earlier and later works explaining the system—including the latest plan of securing drawn combs prior to each season, without any fitting or cutting out—have been freely circulated in that country, several writers are still considering my earlier plans of cutting out the combs and fitting them into sections, as first published in the 1886 pamphlet.

Nevertheless there are many who have already adopted the later plans I have offered of working the new combs right in the sections without any after cutting and fixing, and the results have shown upwards of 50 per cent. additional yields in consequence.

The Ideal (Manufactured) Drawn Comb

was produced by the A. I. Root Co. some twelve years since, being a comb of very delicate construction more than half the completed thickness of section combs. This, however, was too costly and difficult to make, and would not bear transit in bulk, hence the best way of purchasing

super-foundation is still that of securing in the first instance such as is as thin as possible, with no side walls, while the wax itself should be very clean and of a light straw color.

Cutting and Fitting Finished Comb-Honey into Sections.

Some attempt has been made by American bee-keepers to cut sealed comb-honey from larger frames, fitting the squares into sections and giving them back to the bees for them to fasten and finish.

This process can only be regarded as a very crude and non-economic method, as it is very certain the same sections could be better filled, and the comb-honey just as quickly built from drawn combs started as herein described, while they would be more secure, without any of the sticky mess and labor involved in transfering the dripping combs.

The value of cottagers' condemned bees depends largely upon them being obtained as early as possible, and at a merely nominal cost. Those procured locally are of far more value than such as are purchased from a distance, and therefore confined for a long time on rail.

These bees should always be started in hives previously dressed with a powerful antiseptic, and supplied with medicated food.

CHAPTER XXVIII.

DRIVEN, OR CONDEMNED BEES.

WHERE these can be secured the general rules laid down for management of ordinary stock will of course apply in their case.

There are, however, a few minor matters that require attention, especially by those who have had no practice in this undertaking. Where the surrounding cottagers are willing to part with their bees instead of killing them, the general way is for the bar-framist to have them for his trouble, but no more than one shilling should be given for each lot, or they may turn out a dear bargain.

How to Carry the Bees.

By using lightly-made straw skeps, the bee-keeper can carry eight or nine around his shoulder, slung on a broad strap. Thus by uniting, after driving, two or three lots into one, I have been able to carry home the bees from a large number of cottagers' skeps, over a distance of four or five miles where no trap could go. When a conveyance can be taken, light well-ventilated boxes may be used to greater advantage.

As soon as the bees are driven from their combs, secure them at once by tying a porous cloth over the mouth of the skep; and when two or three are to be placed together, let them be united as soon as driven, first securing the queens not wanted, leaving a young one to preside. If there is any use for other surplus young queens, place such in Benton cages with a dozen or more workers each.

The Novice

should always begin by driving a skep or two of his own at home, and never attempt to practise first on the property of others, not only for the sake of his neighbor, but for his own and that of bee-keeping generally. After some experience in driving, then Mr. Lyon's "Bumping" process can be followed to advantage in many cases, though driving will often be more satisfactory, as being less inducive to robbing, there being no broken honey to excite the bees.

To prevent robbing it is sometimes advised that all hives not being operated upon are to have their entrances closed with a bunch of grass inserted lightly, that ventilation may not be impeded. Where an outhouse can be utilized, however, there is no need for this operation.

Attention has already been called to

Foul Brood and other Diseases,

and the bee-keeper should be on the watch for these when he may be taking bees. Where disease is discovered the bees will be perfectly useless, as probably it would have developed quite early in the season, and the remaining occupants of the hive will not pay for their carriage home. Tell the owner of the condition of the bees and get him to smother them the same evening by the old plan, both for his own sake and the benefit of his neighbors. The

whole skep must be burned; and do not fail to impress upon him the importance of leaving none of the honey in any way exposed.

The owners of skeps cannot be induced to carry out any beneficial treatment, while the fact that the combs are fixed largely precludes any possibility of cure if attempted.*

When to Hive the Bees.

One is so often told that it is desirable to place the bees in their new hive the same evening they are brought home, that I think it necessary to show how robbing need not occur, even if combs wet from extracting are given to them at the middle of a warm day. It is considered that when put in during the evening all the bees congregate to the hive, but they would not in the daytime, besides being liable to get robbed out.

The fact is, with cool evenings often experienced in Autumn, many bees are lost by not being able to note their location; whereas in the daytime they gradually settle down to the one spot like a new swarm and not one is lost, while the bee-keeper is able to find his extra queens, and is in no trouble about darkness coming upon him before he has half finished.

Place the Frame-hives in Position,

quite empty, and shoot in the bees, taking care that only one queen is left to preside over the two, three or more lots united. Now get your stored combs or those fresh from the extractor, and arrange them in position; put on the quilt and cover all securely, leaving the entrance several

---

* The Managers of the *British Bee Journal* have to deal with queries from many owners of bar-frame hives who are not self-reliant; and in these cases also, their advice to destroy bees affected by Isle of Wight disease, may not be objected to.

inches wide. As the stored combs are given just before closing no robber bees are on hand; but where empty combs or foundation have to be inserted, feed carefully every evening until the hive is well supplied.

Taking average lots, the number to put together to make a fair stock should be as follows, according to the manner in which their house may be furnished—with stored combs, two swarms; with empty combs, three; foundation, four.

Driven Bees and Foundation.

It should be realized that it is quite useless to supply driven bees, or equally late swarms, with both combs and new sheets of foundation. They will neglect or only work the foundation in a patchy way, while bulging out the combs with the stores supplied to them.

With foundation only, if the bees are fed rapidly the new combs are evenly developed, and soon a fair sized brood nest is set up. With combs only, rapid feeding also results in a more satisfactory condition, and develops the larger brood nest.

Uniting directly to other Stocks.

A wasteful plan, which results only in the loss of bees and time, is that of adding driven bees to weak colonies at home. Without considering that fighting is certain to cause the death of thousands in the hands of many bee-keepers, but too frequently these bees only die out before Winter is half over, leaving the stock worse off than before.

To be in any way satisfactory for this purpose the driven bees must first be made to develop a fair-sized brood nest in another hive on the spare combs of such lot; when plenty of young bees are hatching *then* unite to your weak lot, saving the queen most to be desired. Feed and prepare for Winter as hitherto shown.

Uniting has already been explained in Chapter II., especially as regards making the bees queenless.

Plumping.

The Author's system of "plumping" will be found highly beneficial in building up driven bees. Under the usual conditions there has always been great difficulty in inducing the bees to develop a brood nest of sufficient extent to compensate for the loss of life in storing the necessary food for Winter.

Rapid feeding with syrup followed by a large cake of candy,* will always be found to start a good brood nest in the case of condemned bees, when re-established in bar-frame hives.

---

* This candy is used up before Winter, and none should be supplied after September.

The time is not far off when the bottles on the doctors' shelves will be reduced to a very small number, and resort will be had to simple living, suitable diet, plenty of sun and fresh air. I look forward to the time when people will leave off the extraordinary habit of taking medicine.*—SIR FREDERICK TREVES.

CHAPTER XXIX.

THE PRODUCE OF THE HONEY-BEE.

THE USES OF HONEY IN HEALTH AND DISEASE.—NOTES ON GENERAL HEALTH.

HONEY is a sweet which pleases the palate of the multitude; but instead of being regarded solely as a luxury, it should be the producers' aim to teach the public to use it as a daily necessity; and also as a food-medicine that restores health where drugs will fail.

There are, of course, various medicinal substances, apart from injurious drugs, which act beneficially in building up healthy tissue or living cells, and honey is one of the most valuable of these.†

Potassium salts appear to be not only a helpful, but an absolutely necessary item in building, or in completing the combination necessary in building up the vital cells and

* The Author has taken no medicine for fifty years, but while deploring the reckless use of injurious drugs, he is always anxious to acknowledge any well-proven efficient medicinal medium.

† In this connection may be mentioned the distressing malady known as Goitre, which is most successfully treated by the application of an extract from the thyroid gland of the sheep; treatment so simple that it should always be used in preference to Iodine and similar noxious drugs.

tissue composing the animal body.* These very necessary natural salts are largely excluded from the dietary of civilized peoples, through their suicidal policy of washing these invaluable food particles down the drains, instead of retaining them when cooking the various vegetables in daily use.

Cancer Curable.

Only a few years ago Dr. Forbes Ross, after many decisive experiments, startled the medical world by declaring that the absence of potassium salts was the cause of cancer ; allowing an unnatural or incomplete combination of cells or tissue in certain parts of the body ; while contusions or friction were only hastening or aggravating causes where there was a predisposition to cancer. This celebrated investigator, and others have since demonstrated, to the untold joy of numerous sufferers (already given up as incurable by their own doctors), that the regular use of potassium salts is a positive cure for cancer, and as a matter of course, a certain preventative.†

Potash in Relation to Soil and Plant Life.

When we come to the question of the mineral constituents of the soil, and their relation to plants (and animals) extracting their living principles therefrom, we find that nearly all plants have a starved appearance if

---

* "Assimilable salts of potassium when administered to a *bona fide* case of cancer, will be found to benefit the patient in an astonishing manner, and will never cause the least harm or injury even to the most feeble and exhausted sufferer."—*Dr. Forbes Ross.*

"The enormous death-rate from cancer is to a large extent due to the fatuous and almost universal resort to operation, with its accompanying mutilation."—*Dr. Robert Bell.*

† Further interesting and most valuable information may be had from the Natural Cancer Cure Co., Lebanon Park, Twickenham, Middlesex.

the soil is deficient in potash. The grasses have little or no nutritive value; the clovers are almost non-existent; while fruit trees may shed their blossom without forming fruits.

A dressing of potash immediately improves the feeding value and increases the bulk of grass crops; while plants of the clover family, hitherto starved to death or unable to germinate from dormant seed, will be found thickly crowding the ground and growing most luxuriantly. Fruit trees put forth new root and top growth, bearing more and larger fruits.

Of course this is only one, but without doubt the most important item in connection with plant life, not even excepting lime or phosphates; and the facts set out must further demonstrate the absurdity of civilized man in largely discarding potassium salts from his diet, seeing that his own body must be built upon the proper balance of the mineral constituents of the soil which supports him.

More Potash, more Starch, more Sugar.

It has been shown that clover land becomes "sick," and some clovers will not grow again in the same field for seven years; that is until available soluble potash has again been unlocked from the soil. An added supply of soluble potash therefore means more starch manufactured in fibre and leaves, with a more robust growth, and ultimate development into sugar in fruits, and nectar in flowers, all in greater quantity.

Basic Slag and Potash for Honey, Milk and Hay.

Careful experiments have shown that the most profitable returns in farm crops are gained by dressing the soil with 10 cwt. of basic slag, and 1 cwt. of sulphate of potash to the acre. As the beneficial result lasts beyond two years, and the first cost is under £2 per acre; the estimated

return of at least £3 per acre (clear of incidental expenses) for hay each year, may be regarded as all profit, where the owner's bees work on the clover, and his milch cows are pastured after mowing; with largely increased milk yields in consequence of this mineral dressing.

Honey is a truly wonderful gift of Nature, and stands almost alone as a pure natural sweet. There are very many people who have the impression that bees *make* honey; and the term usually applied by authors to the domesticated honey-bee—*Apis mellifica* *—is in accord with that belief, which may be allowed to pass as half the truth. Flowers *secrete nectar* under the action of the atmosphere upon the juices of the plant in connection with the chemical constituents of the soil from which its roots extract nourishment; and this process is continued daily during favorable weather, until the bee, while gathering such production, is the means of mixing the pollen of different flowers, almost invariably of the same kind; and thus being fertilized and the plant made capable of reproduction by seeding, the object of the sweet attraction is accomplished; the flower fades, and the nectaries are dried up.

Nectar as gathered is next digested and otherwise manipulated by the bees, and so converted into true honey as we use it; just as sugar syrup may be turned to honey after treatment by the same workers.

The starchy substances of plants are converted into sugar under a naturally maturing process, just as we know the same routine takes place in the ripening of fruits.

In the case of nectar, heat is the great ripening and productive agent, the quantity also being largely determined by the available chemical constituents of the soil. A high temperature always ensures a rapid secretion and flow

* "*Apis mellifica*" refers to the bee as a honey-maker; the term *Apis mellifera* as a honey bearer.

towards the plant's flowery mouths and tempting lips, encouraging the bees to frequent visits; while a cool state of the atmosphere will be found to immediately check the flow of sweet juices.

It may be of interest to consider that seeds develop sugar from starch as they germinate under the influence of warmth and moisture, hence the early and rapid development of the young plant. The plant again develops sugar from starch, particularly at the bases of the new buds, whether destined to unfold as further chemical laboratories, as leaves, or as flowers with exposed nectaries.

Honey from Sugar.

Chemists are usually agreed that cane, beet, and honey sugars have a similar composition, and that sugar syrup after being fed to, and treated by the bees, is found to be honey.

Under manipulation by the bees both crude nectar and sugar syrup undergo chemical changes and additions, and finally are closely allied in composition and food value; the characteristic flavor and aroma of flower honey being absent from sugar-fed honey. Refining and heating, it should however be observed, remove the original color and odor of raw sugars. Nevertheless some of the best of honey from flowers is as white as sugar syrup, so that color is not a very important distinction.

Raw Nectar,

as gathered, is not a suitable food for man or insect, and may then be inferior to the sugar of commerce. Original cane sugar (as expressed from the plant) is regarded as a complete natural food in itself. Chemists conclude that all plants used for the purpose, including beet, (as well as many not brought into requisition), yield "cane" sugar.

This does not alter the fact that chemically refined sugar

is inferior in food value until it may be again rectified by the bees as they manipulate and store it; just as they change crude nectar into honey, fit for sustaining life.

There appears to be no reason for the supposition that formic acid is added to honey by the bees, as many have imagined. Rather is it likely that the bees obtain their own formic acid involuntarily by the natural process which crude honey is subjected to under their manipulation; as this acid is also developed in connection with the usual manufacture of ordinary sugar.

The Crude Nectar,

on being disgorged by the bee from its honey stomach, does not form honey as we use it. The newly gathered liquid is distributed over as large a comb surface as the number of vacant cells will allow; and thereafter the heat and ventilation afforded by the prosperous condition of the colony at the time, together with the constant circulation of air maintained in a systematic manner by the vibration of their wings, kept up by a regular force of workers, in due time ensure the evaporation of all excess of moisture. The honey then being ripened is gradually shifted to the upper and outer margins of the combs, where the cells are being purposely lengthened for storage (or to the super space when provided) and ultimately capped over, as filled.

In addition to evaporation by ventilation, the bees are able while flying to discharge a great deal of the excess of moisture; while chemical changes are carried out while the honey is being shifted as above.

Medicinal Qualities.

Honey requires no digestion, but enters immediately into the system; it is productive of heat, and by its regular use, the entire organism is benefited in a high degree, as

it not only stimulates the appetite and aids digestion, but is at the same time better than any medicine for regulating the system.

Persons inclined to be costive, especially children, will find honey restore them to a perfectly normal condition; while the continued use of purging medicines on the other hand causes a distressing reaction, because each dose impairs the delicate and marvellous membrane lining the stomach; whereas the only rational course to pursue is that of endeavoring to restore the already injured or relaxed parts.

Persons in fear of consumption have received great benefit from the constant use of honey. Instances are on record where people have been quite cured by it; while others past all hope of recovery have enjoyed many years of life they had ceased to hope for or expect.

Experts have found that most people, at some period of their lives, are affected more or less by the action of the microbes peculiar to consumption; but the greater proportion of mankind fortunately do not succumb to this malady. It is really wonderful that so many do escape self-destruction, when we consider that many people deliberately shut themselves into a bedroom at night, to breathe the same poisonous air over and over again during the hours of darkness. And yet these same good people would be horrified if they could but fully realize how rapidly they are travelling towards destruction; that the lungs are simply choking for the want of that life-giving oxygen so soon consumed in a closed room, and which the blood is asking for at every fresh breath. Breathing vitiated air feeds the dread microbe, and encourages it to take up its permanent abode, while each succeeding cell of the lung thus slowly destroyed is never replaced. A reasonable supply of fresh air, and a rational diet of

nutritious foods, including fruit and honey, should go far towards maintaining that pure state of the blood which defies microbes of all kinds.

A very distressing malady which will seldom yield to allopathic treatment is that known as "gravel." Honey taken daily is said to effect a cure, and I am quite sure those tortured with this complaint will not fail to avail themselves of such a simple remedy.

Several instances have been given of children almost wasted to skeletons, and at death's door, being brought back to robust life and health by the constant use of honey.

For colds, coughs, and sore throats, I suppose there is hardly a household but has had some experience with the use of honey either alone, or mixed with vinegar, lemon juice, or even butter, in case the palate does not appreciate the pure article alone ; but for

Definite Treatment

the following instructions, if carefully carried out, will prove more efficacious than any system of drugging, because " Nature " is judiciously assisted in her well-known endeavors to throw off disease ; whereas drugs frequently check this attempt, or destroy life entirely.

In the first place, judging from the manner in which honey is generally applied, it is necessary to bring thick ripened honey to a gentle heat after adding a little boiled water. Whether granulated or not, and particularly if in the former condition, full benefit cannot be derived from its use until the honey has been brought back to the same condition as when first sealed up by the bees, and a tablespoonful of water to one pound of honey will generally be sufficient. Newly-extracted honey needs no addition of water, when used at once, as part of it comes

from uncapped cells, from which the excess of moisture has not been removed.

For Sore Throat and Night Cough

mix the juice of one good lemon with one pound of honey, stir thoroughly, and take of this one or two teaspoonsful frequently in connection with the following soothing and always beneficial treatment. At night, upon retiring to rest, fold a large linen handkerchief, and wring it out of tepid water; lay this right round the throat, and over that several folds of dry flannel. The latter keeps up internal warmth and materially assists in the speedy restoration of a normal condition of the throat. Do not remove the throat packing until rising, and then wash thoroughly with soap and water, cold by preference, but tepid if the person has a weak constitution.

For Bronchitis in Adults,

and in serious cases of night coughing, take the lemon honey night and day, and upon retiring to rest procure a jug holding about two quarts of boiling water. Sit up in bed and inhale the steam with the mouth open, continuing for ten or fifteen minutes, according to the strength of the patient, who must at the time be completely covered with a blanket, or mackintosh sheet by preference, that the steam may be retained. Wipe dry after, and lie down; repeating the process each night until relieved. Use the wet pack for the throat if that is troublesome.

For Influenza; Bronchitis in Children;

for severe cold, on the lungs especially, the supplementary treatment should be:—Bran poultices on back and chest, put on not too hot, and changed every twelve hours for the first day or two; then use them only each night. It is imperative that several folds of dry flannel be wound

round and across the shoulders and chest, over the poultices, as well as when they are not in use; and the body must be carefully and quickly washed with warm water (and soap) at every change of the poultices. Keep in one room with a fire and the temperature at 60°; also have the bronchitis kettle steaming all the time.

Without doubt, many cases of severe influenza terminate fatally, where the patient is made to stay in bed; more especially is this the case where poultices are not used in a rational manner for aiding in the removal of the matter clogging all the passages of the lungs.

A fresh chill taken while the patient imagines he is recovering, is more dangerous than the primary attack of influenza, and will often result in pneumonia. Incorrect treatment at this stage is followed by death or consumption.

Like every other part of the body, the lungs require exercise, not only by their own natural action, but also by assistance through the muscular movement of the body. While lying still day after day, the bronchial tubes are becoming more and more corroded; but when an effort is made to rise, even if only for a few hours, natural action immediately sets in, and portions of the strangling phlegm are set in motion by natural expectoration.

Strong acids do only harm, but the mixture of honey and lemon, together with the warm moisture from poultices, etc., will always help on towards a rapid recovery. The bronchial tube is lined with a minute hair-like growth, which is always in active motion, constantly passing onwards and upwards the mucous secretions of the lungs. These restless agents are destroyed by that inflammation generally known as "sore throat," hence the difficulty in then keeping the lungs clear, and the retarding action of drugs and strong acids so frequently administered. On the other hand, the warm pack, and rationally applied

poultices, will immediately raise the vitality and natural vigor of the parts affected.

Sore and Cracked Hands, Chilblains, etc.

For rough skin, cracked hands, itching, spots, etc., the parts should first be bathed with warm water and then well rubbed with honey. If the part is convenient for a plaster the cure will be more rapid and soothing. Take a piece of linen of suitable size, cover one side with honey and bind it on with strips of linen and flannel sufficient to keep in the warmth. Chilblains treated in this way will disappear as if by magic. For eczema add salt to the honey, and a certain cure will result.

Correct *versus* Incorrect Application.

Will our friends of the medical fraternity ever understand the true principles of applying poultices, wet packs, etc., to the poor human body? Under their treatment we nearly always hear of the poultice to be put on as hot as possible, and to be renewed as soon as it cools. Now as a matter of fact, a poultice *when correctly applied never does get cold*; and should be so covered up by flannel or other bandages, not too tightly, that the natural heat of the body responding to the soothing warmth of the poultice, keeps all at a moist blood heat for so long as it is desirable to remain on. This principle may the more readily be understood when I state that a person of strong constitution may just as well use cold water for the wet throat pack, for the simple reason that its temperature will at once begin to rise, and the pack will even appear warmer than if he had used tepid water.

In all Cases of Fever

the application of moist warmth, either by a process of wet packs, or bathing, is a God-given remedy for which

the thirsty body, choked skin, and sluggish crimson river, ever crave, but seldom get under the usual allopathic systems. And what is more remarkable where the soothing hydropathic treatment is carried out the skin does not peel off as is always the case with the destructive drug treatment. The skin is parched because the heated blood has no moisture to spare it, its own circulation being already impeded for the want of sufficient water. It can readily be seen therefore, how the moisture of the pack or the bath, at one stroke, relieves the pores of the skin, while at the same time it gives back to the blood its needed proportion of water, giving it again that mighty circulation, which restores its purity, casting out its dross, and enabling it to laugh at the fever microbes which are now hustled to destruction with no aid whatever from drugs, which only too surely impede the life-giving circulation.

Just one instance, but I could give many. A patient with fever was given up by his doctors; the fever had done its worst, and he was to die. But he could just beg to be placed in a bath of warm water; "What does it matter? it can do him no harm, after the doctors' hopeless decision." And so he was placed in the bath, when that blessed sleep which drugs and fever had hitherto denied him, came upon him there. He slept for a long time; he slept on after they laid him back in his bed—and he slept to get well.

I have had several estimable friends among the medical faculty, but it is when one has retired from active practice that he is most ready to speak lightly of the medical practices of that honorable profession. One of the fraternity, a greatly esteemed friend, asked what medical attendant I had for my family? After explaining that we never have a doctor in the house (professionally), and relied upon common-sense treatment only: "Well, there is one

thing," he replied, "if you call one in it is very uncertain if he will do you any good, but it is quite certain you will have to pay him."

Where one has no knowledge of his own anatomy, and no confidence in himself, of course he feels he must rely upon the medical practitioner; and it is better that he should do that than to drug himself. Again, there is of course a great responsibility incurred in serious cases of illness where a doctor is not called in, as whether he is right or wrong, the law upholds his profession, and forces it upon those who are convinced that his practice is founded upon shifting sands which frequently engulf both his patient, and at the same time his faith in his own methods of treatment.

Lifting the Veil.

Dear reader, have you ever read Smedley's book on the Hydropathic treatment? If not, then you can get it from Smedley's Institute, at Matlock Bath, Derbyshire; where hundreds of medical men have gone to regain that strength, and a new life, which their own medicines have failed to restore to them. Yes, and patients by the thousand which they have failed to cure, have been able to return from Matlock as from death, unto blessed health and life.

Under the heading "Medical Facts," some startling statements were made by Dr. Tyrrell in *Gleanings* for November 1st, 1890, page 774. "I used to think," said he, "and am now of the same opinion, that the science of medicine . . . . was the root of more evil, suffering, and death, than all other evils combined."

"An old doctor of the 'regular faculty' told me that he did not know that he ever cured a patient, and said that he knew he had killed some, but not intentionally."

"For many years I have admired the candor and honest acknowledgments of Dr. O. W. Holmes. When he said 'It were better for the people were all the medicine of the world cast into the sea,' he meant medicine used by the regular faculty, such as he had been taught to use. I don't think he meant water, honey, and other domestic remedies."

"An experienced doctor in Louisville, Kentucky, told me that the people would be better off without than with medicines as he used; but he said he had to visit patients and they would not be satisfied without medicine."

"Many years ago one of my comrades was sick with fever, and the doctor said he would die, as most of his fever patients did; but in the night, when the watcher was asleep in his chair, the patient, 'burning up with fever,' tongue and lips cracked open, 'dying with thirst,' reached the pitcher of water and drank all he could. When the doctor came the next morning he was surprised to find his patient better—saved by Nature's remedy, contrary to the doctor's science (?)"

These Remarks

my reader will believe, are not set forth as the dagger striking in the dark, but rather as the lancet used in the light of day, which our friends of the profession employ that it may prick only, in the hope of giving relief; and I have not any doubt that at least some members of this honorable profession will ultimately agree with me. My only object is to give some relief to suffering humanity, and having myself passed through more than 50 years without seeing any benefit gained by the reckless use of injurious drugs, but too frequently sad and permanent injury therefrom, the foregoing statements may be taken as having a very considerable basis of truth behind them.

Honey as Food.

Though the sweetest of all sweets, honey is not suitable for cooking purposes in such a general manner as sugar, requiring a much larger quantity to sweeten many articles of food, as well as being more costly. There are many things, however, which are much improved by the addition of honey, such as fruit pies or puddings, cakes, etc.; while a basin of bread and milk is made very palatable when sweetened with it.

The following are among many excellent recipes given in the late Mr. T. G. Newman's "*Honey as Food and Medicine.*"

"FOR PRESERVING FRUIT.—Extracted honey is superior in every way. Add one-third as much honey as fruit, boiling until the taste of the honey has evaporated.

"SUMMER DRINK.—Those engaged in harvesting and other occupations tending to create thirst, will find the following preparation a very palatable and healthful drink in hot weather:—Take 12 gallons of water, 20 lbs. of honey, and the white of six eggs. Boil one hour; then add cinnamon, ginger, cloves, mace, and a little rosemary. When cold add a spoonful of yeast from the brewery. Stir well, and in 24 hours it will be ready for use.

"FOR COOKING GREEN FRUIT use only extracted honey, which being the only liquid, holds the fruit firm and gives a very rich flavor. Sweeten or season with spices to suit the taste, and cook slowly until done. Serve dried fruit the same, only adding enough water to swell the fruit.

"GINGER HONEY CAKE.—Take 1¾ lbs. of honey, ¼ lb. of butter, 1½ lbs. of flour, 1 oz. of ginger, ½ oz. ground allspice, one teaspoonful of carbonate of soda, quarter of a pint of sour milk, cream if you choose, three eggs; put the

flour into a basin with the ginger and allspice; mix these together, warm the butter and add it with the honey to the other ingredients; stir well; make the milk just warm and dissolve the soda in it, and make the whole into a nice smooth paste with the eggs, which should be previously well whisked. Pour the mixture into a buttered tin; bake it from three-quarters to one hour; take the white of one egg and beat it up with a little sweet milk, then brush the same over the top with a feather to give it a glossy appearance.

"HONEY SPONGE CAKE is nice eaten warm, and consists of two-thirds of a breakfast cup of sour cream, three of flour, an even teaspoonful of soda, one cup of butter, three eggs, $1\frac{1}{4}$ lbs. of honey, one tablespoonful of cinnamon, half ditto of allspice, and a little extract of lemon; mix the spices with the flour; put the soda in the milk and stir well, that all ingredients may thoroughly mix; beat the cake well for another five minutes; put it into a buttered tin—bake from one-half to three-quarters of an hour.

"BUTTER HONEY CAKE is pronounced by all to be excellent. One pint of flour, one tablespoonful of butter, one teaspoonful of soda, two ditto of cream of tartar, and honey sufficient to make a thick batter. Spread out an inch thick and bake in a hot oven.

"TO MAKE MEAD, not inferior to the best foreign wines, put 3 lbs. of the finest honey to two gallons of water, two lemon peels to each gallon; boil it half an hour, and skim well. Put in the peel while boiling. Work this mixture with yeast, and then put it in a vessel to stand five or six months, when bottle for use. If desired to keep it for several years, add 4 lbs. of honey to a gallon of water.

"A CHEAP HONEY TEA CAKE is made with one tea-cup of extracted honey, half ditto of thick sour cream, two eggs,

half tea-cup of butter, two of flour, scant half teaspoon of soda, one ditto of cream of tartar ; flavor to taste.

"METHEGLIN.—Mix honey and water strong enough to carry an egg ; let it stand three or four weeks in a warm place to ferment ; then drain through a cloth, and add spices to suit the taste.

"HONEY VINEGAR is obtained as follows :—Heat 30 gallons of rain-water and put it into a barrel ; add two quarts of whisky, 3 lbs. of honey, three pennyworth of citric acid, and a little mother of vinegar. Fasten up the barrel, place it in the cellar, and in a short time it will contain vinegar unsurpassed for purity and excellence of taste."

HONEY VINEGAR.—Take 15 lbs. of honey, 8 gallons of warm soft water, one pint of yeast. Mix well, and let it ferment in an open vessel, covered with cheese cloth. After it has fermented for about a week, make a mixture of 6 ozs. of alcohol, 6 ozs. of chemically pure acetic acid, ½ oz. of tincture of cardamom, in 2 gallons of soft water, and add it to the vinegar that is in a state of fermentation. The tincture is to go into the alcohol before the water is added. If the vinegar is kept in a dry, warm place, it will be fit for use in about a month. The crude commercial acetic acid is detrimental and should not be used.—*Canadian Bee Journal.*

HONEY LEMONADE.—Make it in the usual way, using honey instead of sugar ; nothing can be used as a Summer beverage that is more grateful and refreshing. Many thousands of pounds of honey may be used in this way, says the *British Bee Journal*, and all the users be benefited.

General Uses.

Besides the foregoing, honey is used in preparations for preserving leather ; in ointments for various purposes,

such as for chapped hands, sores, etc.; and is very largely used by chemists in their many preparations. For printers' rollers it takes the place of sugar or treacle, doing better work, and making a more durable article.

The reader will thus see that honey is not simply an article of luxury, nor of ordinary diet; and instead of bee-keepers complaining that there is little demand for their produce, let each endeavor to find some new use for it; and thus make an opening for the consumption of honey by the ton, where otherwise it would never have been thought of.

A large firm of biscuit makers was induced to start a new biscuit sweetened with honey, and thereupon required two tons of the bees' product weekly. Though we may not often find an opening for it to this extent, there are many ways in which honey is, and can be disposed of, other than for table use.

SUPPLEMENTARY NOTES.

Estimates as to General Expenses and Returns for Two Years.

FIRST YEAR: GENERAL EXPENSES.

		£	s.	d.
100 stocks in makeshift or second-hand hives	... at 30/-	150	0	0
100 extra body boxes, with frames* ...	... at 3/6	17	10	0
200 dry-feeding dummies	... at 1/-	10	0	0
50 rapid frame feeders	... at 3/-	7	10	0
One 2-cwt. cylinder for reducing sugar to syrup ...	...	1	0	0
Large glue pot, for melting wax to fix guides ...	...	0	1	6
Flat-blade scraper	...	0	1	6
Wax extractor	...	0	17	6
Timber for work-shop and honey-room	...	20	0	0
Labor	...	10	0	0
Timber for frame rack, store rack and sundries, labor, etc.		10	0	0
Rail carriage, cartage, etc.	...	10	0	0
Carpenter's bench and tools, nails, screws, paint, etc. ...		11	10	0
Rent (more or less)	...	15	0	0
Sugar	...	5	0	0
	Total	£268	10	6

Or about $1340.00.

Add the following if Comb Honey is to be worked for.

		£	s.	d.	£	s.	d.
300 sets of super crates	... at 2/6	37	10	0			
6,000 1-lb. sections	... at 20/-	6	0	0			
100 1½-doz. crates, glass two sides	... at 2/6	12	10	0			
100 lbs. super foundation ...	... at 2/-	10	0	0			
General expenses	...	268	10	6			
Total, first year					£334	10	6

Or about $1,670.00.

---

* The 100 extra body boxes must be included as forming an essential item in management.

Add the following if Extracted Honey is desired :

			£	s.	d.	£	s.	d.
	300 extracting supers ...	... at 2/6	37	10	0			
	Uncapping stand, knives, etc.	...	2	2	0			
	Honey extractor	...	1	15	0			
	6 honey cylinders, 500 lbs. each,	at 15/-	4	10	0			
	50 three-dozen crates ...	... at 3/-	7	10	0			
	25 one-dozen crates ...	... at 2/-	2	10	0			
lbs.	100 lbs. brood foundation	... at 2/-	10	0	0			
1,728	12 gross 1-lb. glass jars	... at 14/-	8	8	0			
	12 ,, corks	... at 1/6	0	18	0			
1,728	6 ,, 2-lb. tins ...	... at 18/-	5	8	0			
1,296	3 ,, 3 ,, ...	... at 24/-	3	12	0			
864	1 ,, 6 ,, ...	... at 30/-	1	10	0			
——	General expenses	...	268	10	6			
5,616								
	Total, first year ...	...				£354	3	6

Or about $1,770.00.

GENERAL EXPENSES, SECOND YEAR.

	£	s.	d.	£	s.	d.
Rent (more or less)	15	0	0			
Sugar	10	0	0			
Sundry expenses, carriage, etc.	5	0	0			
				£30	0	0

Or about $150.00.

Working for Comb Honey :

		£	s.	d.	£	s.	d.
Total first year	...	334	10	6			
100 extra super crates	... at 2/6	12	10	0			
6,000 1-lb. sections	... at 20/-	6	0	0			
50 1½-dozen Crates	... at 2/6	6	5	0			
100 lbs. super foundation ...	... at 2/-	10	10	0			
General expenses...	...	30	0	0			
Total, second year ...	...				£399	15	6

Or about $1,995.00.

Working for Extracted Honey:

			£	s.	d.
	Total first year	...	354	3	6
	50 3-doz. bottle crates...	... at 3/-	7	10	0
lbs.	100 extracting supers ...	... at 2/6	12	10	0
2,880	20 gross 1-lb. jars ...	... at 14/-	14	0	0
	20 ,, corks	... at 1/6	1	10	0
1,728	6 ,, 2-lb. tins ...	... at 18/-	5	8	0
1,296	3 ,, 3 ,, ...	... at 24/-	3	12	0
864	1 ,, 6 ,, ...	... at 30/-	1	10	0
——	General Expenses	...	30	0	0
6,761					

Total, second year £430 3 6

Or about $2,150.00.

ESTIMATED RETURNS, AT A LOW AVERAGE, TAKING A SERIES OF YEARS.

Comb Honey: First Year.

		£	s.	d.
100 stocks, at 50 lbs. per hive—				
5,000 lbs.	... at 8d.	166	13	4

Total for the year £166 13 4

Or about $830.

Second Year.

		£	s.	d.
Increased to 125 stocks, at 50 lbs. per hive—				
6,250 lbs.	... at 8d.	208	6	8
Increase to 150; sell 25	... at 30/-	37	10	0

Total for the year £245 16 8

Or about $1,225.00.

Extracted Honey: First Year.

		£	s.	d.
100 stocks, at 75 lbs. per hive—				
7,500 lbs.	... at 6d.	187	10	0
Wax	...	2	0	0

Total for the year £189 10 0

Or about $945.00.

Second Year.

		£	s.	d.
Increased to 125 stocks, at 75 lbs. per hive—				
9,375 lbs.	... at 6d.	234	7	6
Wax...		2	10	0
Increase to 150; sell 25	... at 30/-	37	10	0
Total for the year		£274	7	6

Or about $1,370.00.

In reply to repeated enquiries, the Author wishes to state that he has no catalogue of sundry bee-furniture, and does not supply any of the articles mentioned herein, with the exception of the Conqueror Hive, of which he will be pleased to forward particulars upon application.

Candy, its Use and Abuse.—Bee-candy is almost universally regarded as a supplementary winter food. That is a great error, and modern progressive bee-keepers should condemn the practice.

When and How to Use Candy.—For many years the Author has endeavored to show that candy is best supplied in 6-lb. to 8-lb. slabs run into wired or box frames, and so hung next the brood frames for stimulative feeding *only*, as soon in Spring as the bees break up their own Winter cluster, and have free access to natural pollen. When used for a similar purpose in Autumn, before finishing with syrup, candy frames should all be cleared away before September 15th.

***Nosema apis.*—Self-contradictory Statement.**—It has recently been stated that *Nosema* is the cause of all bee complaints save that of foul brood! Nevertheless, if *Nosema apis* is, as already declared to be, the cause of the I.O.W. trouble; and now is erroneously said to have been the cause of all minor bee ailments for generations past, then most

assuredly we ought to have had, and without question should have had, the I.O.W. plague in dire evidence for centuries prior to its advent into this country in the year 1904.

There could be no better proof advanced than this quite unintentionally contradictory attempt to tack *Nosema apis* on to all bee complaints (save one), thus showing so clearly, by the simple act of retrospection, that this organism is not responsible for the I.O.W. disease, which was not known in Great Britain before 1904, while bee-paralysis of any kind was of very rare occurrence.

Hence, so far from being the "cause" of any serious bee disease, *Nosema apis* may be regarded solely as an "effect" of a diseased condition—a common microbe—appearing in greater numbers when some other ailment reduces the vitality of the bees. (See footnote, page 146.)

Experts and no Cure!—One of the most astounding features in connection with the I.O.W. trouble is that experts—and among them some of the most prominent lecturers and experts holding certificates—declare there is absolutely "no cure." And yet the Author has repeatedly shown that the cure is most simple, and may be described in a few words.

(1) The substitution of a young queen of a vigorous prolific variety during the active season, will turn a dwindling stock into a prosperous, highly profitable colony—*every time*.

(2) Any plan of division that, during the active season, separates the older and more seriously affected workers from those slightly or not affected, from the younger bees, and the brood still to hatch, will always form a basis of cure.

(3) Feeding any affected stock rapidly with suitably medicated food, will subdue the worst case in twelve or fourteen days; changing the queen meantime.

(4) Where the earlier symptoms of the disease are noticed—with no hairless, dark or bloated bees the trouble is instantly checked by spraying the bees with warm medicated water.

In the Case of Division, the older bees are left on their own stand, with their own hive and original queen, to prevent disorganisation for the time being. These are to be fed with medicated food with starters only in the frames, and a young queen supplied as soon as available. The removed stock will also have a young queen. Swarm and stock may be re-united in due course.

Winter Losses.—The Reader will avoid this trouble *absolutely* after taking the precautions to feed and change queens as above, during the Autumn. Also be careful to provide free ventilation, and avoid restricted entrances.

Combs and Hives not affected.—While the foregoing progressive facts show that hives and combs do not become affected unless actually soiled, undoubtedly dirt accumulating on the hive floor must be regarded as a source of danger, and no reasonable owner will neglect to carefully cleanse and disinfect every hive periodically.

The Absence of Initiative.—Weak lots, old and long queenless bees, should they become affected, may sometimes run out; **but there is no excuse whatever where the owner allows his whole apiary, or any number of colonies, or even a single stock of ordinary strength, to die out under his helpless gaze.** Such a calamity can only result from sheer incapacity and the want of initiative.

Early and Late Stages of I.O.W.—The earlier more simple form of this disease may not always occur, or may escape notice, particularly where the first indications of trouble are found in cool weather, when the more fatal stage has been reached.

I.O.W. Cures and Small Entrances.—Any proposed cure which necessitates a permanently restricted entrance, and at the same time disorganises the bees so that they will not repel robbers, is self-condemned. Small entrances are fatal where I.O.W. disease is in evidence.

Best Colonies first affected.—It frequently happens that the most populous and prosperous colony is the first to show signs of paralysis. Hence over-heating evidently aggravates the malady, showing the necessity of moderate covering and efficient ventilation. If such colonies are at once divided (according to the Author's definite methods of swarming without increase) the trouble is immediately checked, and with the most simple supplementary precautions, as advised herein, the malady is soon cured. **It has solely and always been the helpless "drifting" that has allowed such stocks to go to destruction.**

Individual Diseased Bees in Fatal Stage.—It is quite true that individual workers once reaching the secondary or fatal stage of the I.O.W. complaint can seldom recover; hence the "no cure" theory of those who court failure by joyfully embracing it with both eyes blindfolded.

The Author has, however, definitely explained—(1) how to separate the badly infected from the non-affected and slightly affected workers; (2) how to check further infection by other applications; (3) and finally how to build up a rousing population of hardy, healthy, young bees before the remaining adults die off in the ordinary course.

I.O.W. and Immune Bees.—Many bee-owners persist in retaining, or recommencing with black or native bees, which are unable to resist the I.O.W. plague, and even under recognised treatment fail to recover so readily as some other kinds are known to do. Some of the yellow varieties, more especially such as are carefully bred by selection, with revitalising blood periodically added, are known to be practically immune to this disease.

What means "Practically Immune?"—It is not to be imagined that any such more vigorous strain of bees may not under any circumstances contract the malady. It is

nevertheless an absolute fact that they will not go under should they become affected, but will readily respond to treatment, and during the active season will often throw off the malady without assistance. It should be realized that bees of this quality are more profitable, also carrying more populous colonies, notwithstanding any temporary trouble.

No Rapid and Spontaneous Infection.—There is usually no such thing as wholesale or immediate successive infection of the colonies of an entire apiary with the I.O.W. disease as regards local conditions. Stocks may become infected one after the other, at more or less lengthened periods, **by actual contact only** (see page 158) through carelessness on the part of the owner, or because his neighbors may leave weak or worn out lots to be robbed.

Where stocks appear to be affected one after the other in rapid succession, it is not a case of infection from neighboring hives, but is only a proof that such stocks had already contracted the complaint **from some source in common at a much earlier date.**

An Exception.—Where stocks are in very similar hives placed too close together, and working in the same line of flight, bees enter the hives indiscriminately, and thus affected workers may start the trouble as sometimes found to be the case at the moors.

No Mysterious Infection.—If the owner of bees will only realize, and take comfort from the fact that **the I.O.W. disease is only spread by some form of actual contact** (pages 157, 158), then he may keep his mind free from panic, and will see the folly of beginning to destroy good material, where he might otherwise have renewed vitality and greater profits.

Salt *versus* Slugs.—Salt spread over the ground in front of affected (or other) hives, will effectually dispose of slugs,

which otherwise may crawl over bees dying from disease, and then carry their slimy trail across the fronts of neighboring hives.

Robbing induced needlessly.—Where the hives may be treated with some strong antiseptic dressing such as creosote, the bees make no attempt to keep out robbers, which are immediately encouraged to appropriate the stores. A similar condition is presented where heavy smoking is adopted when inserting queens, the bees being thoroughly demoralised under the process.

Beneficial Treatment of I.O.W.—The Author has frequently advised the following successful plan. Have a spare hive and dress it thoroughly inside with Izal (using two parts of water to one part of Izal), and when nearly dry, with no excess of the liquid left on the floor, insert the bees and combs towards evening; close the entrance with perforated zinc, and leave the bees for some 24 hours, removing the zinc at dusk. The zinc covered entrance will be from 1in. to 6ins. wide, according to the season and strength of the colony. The entrance is shaded during the day by a board or slate.

In Summer, strong colonies are safer divided, treating the removed old stock and remaining bees towards evening; the swarm will not remain in a dressed hive, and must be treated at a later date. Other recuperative and preventive measures advised by the Author should never be neglected.

Not I.O.W. Disease.—Newly hatched bees too long confined by bad weather, may often be found about the ground when attempting their first flight, and with the bowel charged with thick matter. This condition is greatly aggravated should such a stock be packed and sent by rail, during a dull period and the absence of a cleansing flight for many days previously.

Nearly mature brood when slightly chilled, by careless spreading of the brood combs, or from some accidental cause, will result in the bees hatching with dwarfed or crippled wings. Hence many of these will be found about the ground when attempting their first cleansing flight.

The Langstroth Hoffman Frame is in no sense related to the original Hoffman frame as regards its successful application and dimensions, which latter are some 13ins. deep by 16ins. long. Mr. Hoffman wintered his bees safely year after year, while every Spring he had some hundred surplus colonies he sold to others who had lost their bees in shallower frames.

It should be noted that Messrs. Dadant & Sons, who edited a revised edition of Langstroth's work, did not accept the Langstroth frame, but were compelled to reject it in favor of a much deeper frame after a 20 years' test of the two sizes side by side.

Mr. Eddowes, a very practical bee-keeper, residing now in Jamaica, used the 16-in. by 10-in. frame as well as the Langstroth and the British Standard frames in the Argentine, and later in Jamaica. He states that from the first named he procured 330 lbs. of honey to the single stock, but no more than 150 lbs. from the Langstroth and British frames, standing side by side and the stocks starting on equal terms. He adds that with the shallower frames he had more trouble in securing the 150 lbs. than the larger yield with the deeper frames. In Jamaica he still finds the 16-in. by 10in. better than the others.

Severe Losses with Langstroth Frames.—During the winter of 1911-12 in the United States, some 50 to 75 per cent. of the colonies were lost in many localities where the Langstroth shallow frames were in use.

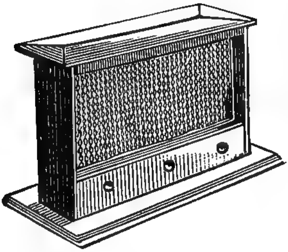


FIG. 90.
Single Comb Observatory Hive.

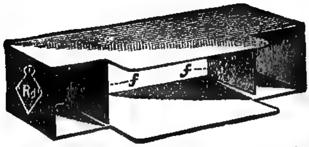


FIG. 91.
The "W. B. Carr" Metal End.

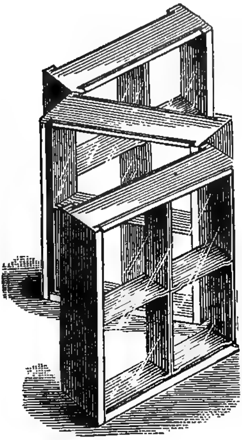


FIG. 92.
Abbott's Comb Honey Exhibition Crate.

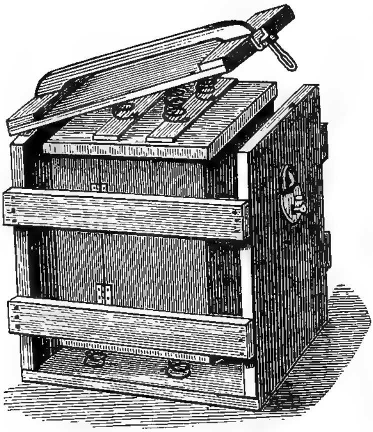


FIG. 93.
Spring Travelling Case for same.

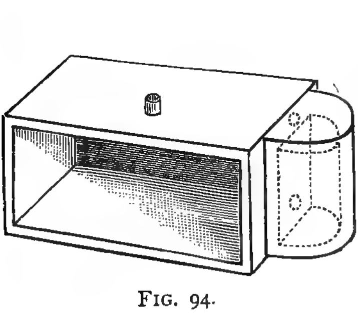


FIG. 94.
Queen Nursery.

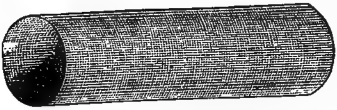


FIG. 95.—Tube Cage.

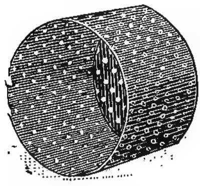


FIG. 96.—Circular Cage.

American Opinion in a number of instances is opposed to the shallow Langstroth frame, spaced only $1\frac{3}{8}$in. from centre to centre, and that frame must not be regarded as the only style used in the States, although unfortunately it happens to be the one most largely exported to other countries, where a deeper, shorter frame would be found more profitable.

Letter from American Bee-keeper.—"The hives in this country are very simple and easy to manipulate, but I do not think they go far enough to make any records as to honey gathered. Of course tons of honey are produced here, but we have to thank the immense richness of our country (in bee flora) more than any intensive or exact manner of handling bees.—Michigan, U.S.A., June 9th, 1911."

Unprotected Hives and Supers; Flat Covers; No Roof Ventilation.—Perhaps many Americans will not agree with the above letter, but it is possible, and I have always considered it to be a fact, that except where chaff hives may be adopted, both American and Canadian hives and supers are often too cheaply made and non-protective.

Transport, Shipping, etc.—Of course there is always the question of transport, moving many hives to the cellars, etc.; when it is evident that a light hive takes up less room, and is more readily handled. But do these advantages compensate for the loss of 50 to 100 per cent. extra hard cash, such as more protective methods would certainly ensure? An exception certainly occurred in the State of Michigan, where, during the very exceptional season of 1913, Dr. C. C. Miller secured an average of over 200 lbs. of comb honey.

Loss of Energy.—There are of course plenty of flimsy hives in Great Britain, but British bee-keepers could not use flat covers with no top ventilation. In Winter the bees

would consume too much food and lose vitality; while in Summer the workers would waste much time in fanning, or hanging out during the day, and at night the exposed comb-supers would be neglected to a large extent.

For Extracting, the more simple hive is not so objectionable in Summer, as unlimited space may be allowed. The Dadant hive (with the large "Quinby" brood frames), No. 1, is seen with a protective cover; the dovetailed hive, No. 4, appears almost too slight to be of any practical value.

Swarming without Increase.—Doubling and Swarming without Increase.—One cannot over-estimate the vast benefits to be gained by these original methods advocated by the Author since his 1886 pamphlet, and which enable the bee-keeper to take the question of swarming entirely into his own hands, so that he will secure honey by the hundred-weight, and by the ton; instead of having persistent swarming and poor results.

Paying the Rent.—In just one little corner of your farm or garden there may be a few hives of bees, prepared to pay the rent, foraging over hundreds of acres, gathering in produce of great value, paying nothing for the privilege, and doing no one any harm because of this gentle art of appropriation.

How I.O.W. Disease may Decline.—When all bee-owners will realize—and follow, as many have already done—the rule laid down by the Author in the *British Bee Journal* of September 5th, 1912 (back page of cover), this disease will gradually, and certainly, die out. The Law is this: "Young Queens, and medicated food supplied to every stock every Autumn; and always when feeding is needed. Natural stores, and candy in Winter are finally and absolutely condemned where this complaint may be in evidence.

Comb Honey for Exhibition.—Combs intended for exhibition are objectionable when worked between fence separators, because of the wavy or ridged surface of the combs. On the other hand a greater yield may be secured by using these dividers.

Starters in Sections are also objectionable from the same point of view, in that the combs being often finished off with drone, or large store cells, have a coarse appearance. Full sheets of very thin worker foundation should be used in every section, whether intended for the show bench, or as the more profitable investment.

Sections to Hold Sixteen Ounces.—The $4\frac{1}{4}$-in. by $4\frac{1}{4}$-in. by bare 2-in. with flat separators, which may be either single or double as designed by the Author; the $4\frac{1}{4}$-in. by $4\frac{1}{4}$-in. by $1\frac{3}{4}$-in. through, with cleated separators; or the latter with no dividers.

The 5-in. by 4-in. by $1\frac{1}{2}$-in. with cleated separators, and no bee-ways; or the same with no dividers, with bee-ways; and the 5-in. by 4-in. by $1\frac{3}{4}$-in. with flat separators, also with bee-ways.

Those tall sections which are only $1\frac{3}{8}$in. through must be condemned, as they not only hold considerably less than 16 ozs., but are non-practical, with the extra thin comb.

Free Passages to Sections.—The Author was so convinced that much surplus honey is lost to the bee-keeper by the restricted spaces allowed between sections where single separators have been used, that he devised a *double* separator (either fence or metal slotted) with $\frac{1}{4}$in. between, thus allowing double the number of bees to pass more quickly. Many thus reach the upper crates without passing over the lower sealed comb surfaces; consequently there is less discoloration from "travel stain."

Slight Variations in Weight may be rectified by making the cleats slightly thinner or thicker as required.

Cyprian Queens were first introduced into England and America when Messrs. Benton and Jones returned from the Far East in 1880. After exploring the Indian jungles in search of *Apis dorsata* (the giant honey-bee) Mr. Benton returned to Europe and arranged with a bee-keeper in Cyprus to procure and despatch queens of that island to his various customers; and later proceeded to Carniola where he was located for several years, despatching many queens to various countries. These included Carniolans, Cyprians, Holy Lands and Syrians—the latter two varieties being procured through Mr. Baldensperger (Senr.), who had resided at Jaffa for many years.

Consequently Holy Land queens were available some time before the return of Mr. Benton from the Far East; the Author having used one earlier than 1880, while his first Cyprian was procured from the earliest parcel brought back by Mr. D. A. Jones in that year, on his return to America.

Mr. Dervishian was sending out Cyprians from about 1882; and during the latter year Mr. T. B. Blow went out to Cyprus and brought back a number of queens which he distributed among various English bee-keepers.

The Reverse every time.—Many unfortunate bee-keepers have been advised that thin syrup supplied early in Spring causes dysentery. But numerous stocks would have been saved from destruction, and others from dwindling, had they been given thin syrup instead of candy from the end of February. That is the most economic method of supplying water at the time the bees urgently need it.

Such is the Author's practice, while he gives no candy in

Winter; and dysentery is a unique experience with colonies in his apiary.

The Author's Hive Scraper.—If the Reader would like the best hive scraper; one that he may hand down to successive heirs unimpaired, then he may secure a mason's trowel of the smaller size—and be happy ever after.

Extra Prolific Queens.—These cannot be managed by the "let 'em alone" policy generally adopted by "single chamber" bee-keepers, who failing to work correctly, condemn such as useless. The Author's methods of "Swarming without increase," and using two or more stock chambers, will always give magnificent results from extra prolific queens of a good strain.

Poor Seasons and Inferior Localities.—So many owners imagine prolific bees are useless in a short season, or in such as they are pleased to imagine is a district of limited capabilities. Hence their results are always restricted by their own limited visions, which will not allow them to realize that the short season requires the greater number of bees to gather quickly what is to be got.

Under the Author's instructions districts formerly averaging 25 lbs. of honey to the hive, have been found capable of yielding up to 170 lbs. per colony.

The *British Bee Journal* and the *British Bee-keepers' Record* were formerly conducted upon the principle that no trade interests were to be connected with the management, thus, as it was considered, ensuring an unbiased expression of opinion.

Nevertheless, while I at no time agreed with that principle, as not serving the best interests of the trade which supported the journals; it is now satisfactory to note

that the old dogma of exclusiveness has been departed from, to the benefit of the whole community.

Mr. T. W. Cowan has associated with himself a prominent bee-master and lecturer, and one who has worked practically right through the appliance trade from A to Z, whose well-known ability has already made its influence felt in the conduct of the journals mentioned.

It can only be those from within the trade circle who can best serve the interests of the entire bee community, where honest and disinterested endeavor is the main-spring of action.

Mr. Herrod has also recently taken up the reins of management of the British Bee-keepers' Association, with such evident success that it is to be wished he may long continue to vitalize its new-born and rapidly extending influence.

A most Instructive Report of the doings of an Irish bee-keeper was given in the *British Bee Journal* on March 22nd, 1894. The apiarist, it will be observed, expended little labour over his apiary, and felt assured that his uniform success had been attained *solely through the superior advantages possessed by a large frame.* After describing the apiary the correspondent proceeds—" the hives were all with 16-in. by 10-in. frames; and what struck me as peculiar about these hives, was their size, solidity, and fine finish. * * * " I append an account of returns of his apiary in the Canon's own words, from a letter I had received from him on the 15th of this month. "My unvarying success through all seasons for the past 15 years is remarkable; as I have neither fed, nor stimulated, or requeened, nor done anything to promote greater activity among my bees, so I disclaim all credit for my success, except that of providing room and material to work upon. The season of 1892 was generally a bad one, yet my take of finished sections amounted to

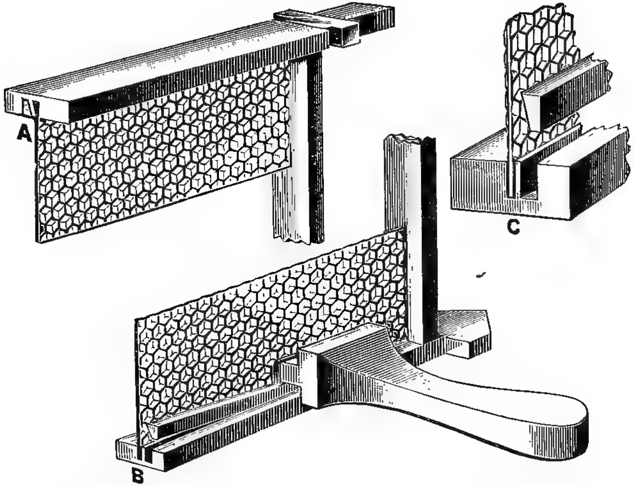


FIG. 97.—Abbott's Twin-grooved Frame-bar with long wedge-slip for securing foundation.
(Patented by Mr. S. W. Abbott, Feb. 4th, 1887, No. 1802.)

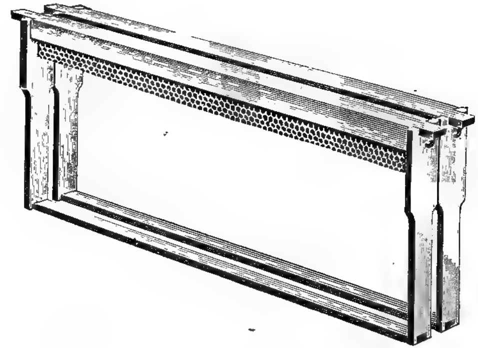


FIG. 98.—The Root-Hoffman Langstroth Frames.

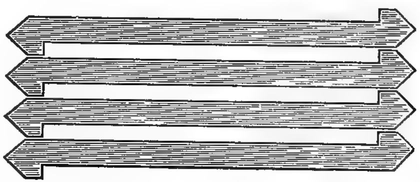


FIG. 99.—Abbott's Self-spacing Wide-end Frame-bars.

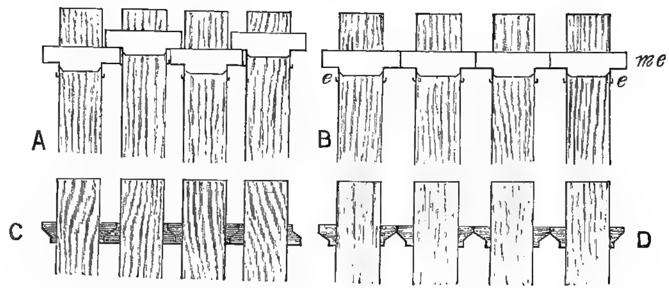


FIG. 100 (favor of L. Upcott Gill, Esq.).
Methods of Spacing at natural and reduced distances.
A B, with W. B. C. ends. **C D**, type-metal ends.

1,792, and from unfinished $3\frac{1}{2}$ cwt. of extracted. Notwithstanding the great interruption of work by swarming, no less than 40 out of 45 that had made advance with section work having swarmed again and again ; but the late harvest made up lost way. Again, 1893 was a very broken season, so much so that when you visited me I told you I did not expect to exceed 1,400 finished sections ; yet, although the weather continued much of the same character, I obtained over 1,800 finished and $5\frac{1}{2}$ cwt. of extracted ; all of the latter, and 1,728 of the former, I sold to one firm in London, at I may say, a high price, and with huge praise as to the quality of both, so I have reason to be satisfied with my results." This is not bad for an octogenarian (considerably over a ton of honey last season from 50 working hives), and for one who has often no time to attend to his bees when they require it. They swarmed six times last year, five of which swarms he lost, having been obliged to be from home on more important duties than bee-keeping. I have noticed that this apiary has yearly, for these last seven seasons, turned out nearly a ton of honey, and can come to no conclusion but that the large frame has a great deal to say for such high results. The Canon writes in reply to a query of mine—" With regard to the 16-in. by 10-in. frame, it certainly gives greater scope to the working powers of our stocks, which would be cramped in small standard frames, especially if used in my locality."

Selling Honey.—A bee-keeping chemist who wrote me not long since says :—" I commenced bee-keeping two years ago, and have about 20 stocks. As a help to some of your clients I would suggest they endeavor to persuade some chemists in fashionable watering-places to put a large show of honey in their windows—sections and pots ranging from one to ten pounds, and if properly displayed the sale is very

great. I have sold over my counter since July (letter dated April 24th), nearly two tons, not at a low figure, as that would kill the sale, but clover honey at 1s. 3d. per lb., and heather honey at 1s. 5d. Clover sections at 1s.; heather sections at 1s. 3d. I would also advise that any chemist, making honey a leading line, should keep one or two hives of bees; he is then in a position to interest his customer, who at once has confidence, and moreover, is in a position to answer any questions and silence people who are so very ignorant that they know better than the seller."

The Bees, the Forage, and the Man.—In an article in *Gleanings in Bee-culture* for July 15th, 1902, Mr. J. L. Gandy unfolds one of the most interesting experiences that ever fell to the lot of a bee-keeper. He has had as much as £5,000 from his bees within two years, but here are his own words:—"I give herewith some ideas obtained during my 30 years' experience as a bee-keeper, the last seventeen of which I have handled them as a commercial pursuit, keeping during this time from 500 to 3,000 colonies, 100 of them being in my home apiary, of which I more particularly write. . . . When I started bee-keeping on a large scale my neighbor bee-keepers did not average a surplus yield of over 50 lbs. per year to the colony. I immediately set about improving the bee-pasturage, and my average yield of surplus for eleven years was 150 lbs. to the colony, and for the last six years it has been 300 lbs.

"My net profit for eleven years was a little over 400 per cent., and for the last six years it was 800 per cent. Last year my home apiary, of which I am now writing, 75 colonies (spring count), gave me 407 lbs. to the colony."

After saying that he started bee-keeping through his health failing, and being in debt to the tune of 25,000 dollars, he gradually bought up bees until he had 500,

presently 2,000, and finally some 3,000 colonies, and meantime had paid off his debts from the proceeds, and had regained his usual health. Then began a series of investments in farm and fruit lands to the extent of thousands of acres, all being by profit from the bees. He found a small hive of little value, and these were soon discarded for large double storied hives.

Large Hives and Judicious Planting were the foundation stones of his remarkable success. " . . . Bees," he says, "even in an eight-frame hive, generally use the two outside frames on each side of the hive for honey and pollen, and this leaves but four frames for brood rearing. This will not produce one-sixth as many bees as the colony should contain. I went through a colony having on six ten-frame hives last summer, and it had brood in 32 frames. That hive produced over 500 lbs. of surplus, while the same colony, in an eight-frame, with a queen-excluder used, would not have produced to exceed 100 lbs. of surplus. A queen-excluder will exclude the queen, and will also, to some extent, bar or greatly hinder a well-filled hive."

Working two or more Queens in one Hive.—Many years ago Dr. Stroud, of Port Elizabeth, South Africa, mentioned in the *British Bee Journal* that he had a system of working any number of queens in one hive or colony, and that he had long practised that method.

Mr. Heddon, of Dowagiac, Michigan, claims to have been the first to point out the possibility of working more than one queen in a hive. Doolittle and others made some practical demonstration of the fact, but neither of them preceded Dr. Stroud.

Mr. Wells, of Alresford, however, was the first to reduce the matter to practical working as a system in honey production. See the *British Bee Journal* of 1892.

The stock hive is divided by a perforated wood dummy, while the bees from both sides have common access to the supers placed over excluder zinc.

See Chapter XIX. for the latest methods of working two or more queens together.

Two or more Queens in Tiering Hives.—In my 1893 edition of *A Modern Bee-Farm* I illustrated a method of tiering up single stock chambers, with two, four, or more queens, before adding the supers, and showed how to unite them safely. This plan, however, is not in any sense equal to the lateral "turn-over" plan, which (with my intermediate way) crowds the whole maturing working force into one stock chamber, so that the supers are more rapidly filled, and no stores can accumulate in surplus stock chambers, as in the usual tiering up methods.

Glass Rail Sections were used by the Author prior to 1880, with split top rails, and grooves down each inside of the uprights.

V-groves substituted as a so-called "improvement" upon my plain-cut three-side-slit sections are detrimental in practice, and necessitate the foundation resting upon the bottom bar, when it buckles up, and is inclined to drop from its insecure hold at the top and sides.

Foundation in sections should never reach the bottom rail by a space equal to ¼in. This allows for stretching by the heat and weight of the bees ; the foundation remains even all over, and when held within the plain-cut groove will never fall.

By a careful experiment I have found there are 3,500 worker bees to the pound. Queens will live from three to four years ; drones, three months ; workers during Summer, because of the wear and tear and risks by flight, the average

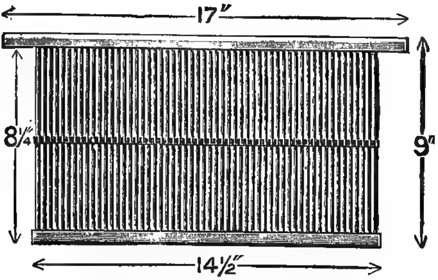


FIG. 101.
Wilkes' Wire Divider (Standard).

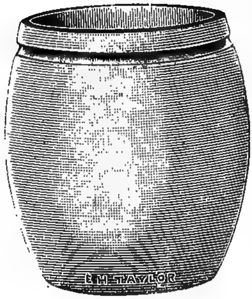


FIG. 103.—Glazed Earthenware 1 lb. Honey Jar.

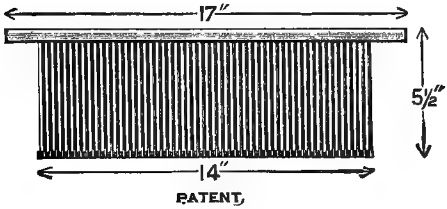


FIG. 102.
Wilkes' Wire Divider (Shallow).

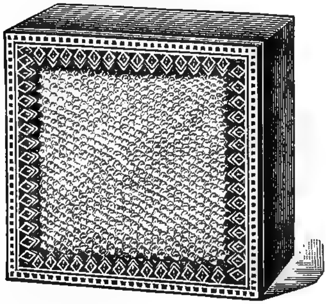


FIG. 104.—New Fancy Card Case.

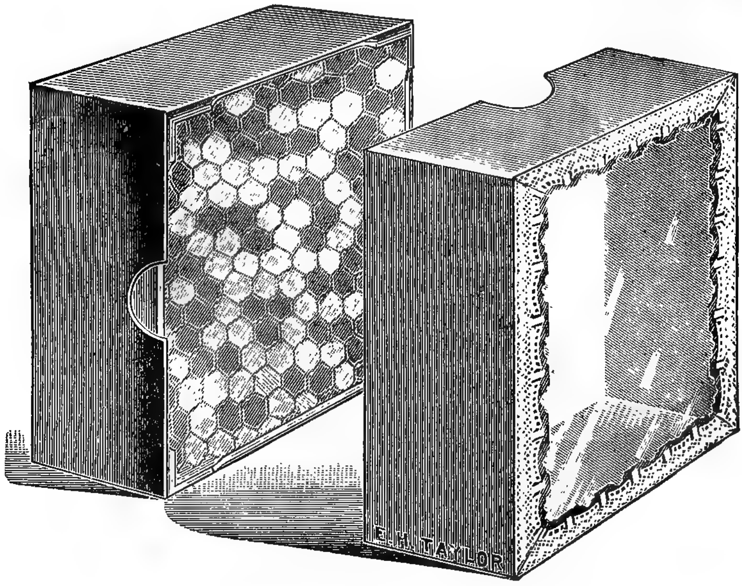


FIG. 105.—Glazed Section Case.

(A page from Mr E. H. Taylor's catalogue).

FF

is six weeks, and through the quiet months of Winter six to eight months. The Author has had many live ten months.

Fertile workers are not often troublesome except in the queen-raising apiary. When they persist in laying in nuclei, do not attempt to give virgin queens, but at once supply a good fertile queen on a comb of brood, with accompanying bees; this also being the very best and simplest cure where they are found in stocks of greater strength.

Where eggs of fertile workers are placed in worker cells, many of the larvæ die before reaching maturity, otherwise the cappings are raised much above the surface, as with normal drones. The males resulting are dwarfed and non-virile.

While I have had ample evidence to show that bees are able to retard the development of both eggs and larvæ by withholding food; where a colony has been queenless for more than ten days, the presence of uncapped larvæ, whether in queen cell cups or ordinary cells, may be put down to the action of fertile workers.

Bees winter best with plenty of room below the frames. Many of my own stocks have been wintered with the lower body under the stock chamber, as used for prevention of swarming, with very satisfactory results. The Conqueror supplies this space without a second chamber.

Syrup without Cooking.—A self-acting principle was introduced by me some 30 years since, was illustrated in my Non-Swarming Pamphlet, and described under three forms: (1) The "Amateur," all metal and circular, holding 9 lbs., for top of the hive; (2) The "Frame" feeder, all wood, except the perforated sugar holder inside, holding about the same

quantity; and (3) The "Commercial," a double compartment feeder of full size, to go on top of the hive, and holding anything from 20 to 40 lbs. of syrup; all arranged for the simple process of putting in the usual proportions of sugar and water, when with no further attention the whole is shortly reduced to syrup.

The sugar must be *suspended* in the water by means of the perforated compartments as shown in Figs. 65, 70, 72, 73 and 74; thus allowing a free circulation of liquid under.

Abbott's Self-spacing Frames (Fig. 99).—These frames present a very neat appearance, they are less affected by propolis than other frames of the self-spacing kinds, and are always cleaner than metal ends, which present a sorry spectacle as soon as they become rusty.

By-the-way, Messrs. Abbott offer metal ends constructed from aluminium, which, of course, do not become discolored.

Metal Ends for keeping brood frames equi-distant are illustrated at Fig. 91. These were the invention of the late Mr. W. B. Carr, and are so cheaply produced by several manufacturers that the cast metal ends have been driven out of the field. Their formation permits of using frames at two distinct distances from centre to centre, though the fact is seldom taken advantage of, and when once placed on the frames the set distance is generally retained.

The Author uses no metal ends, finding them most inconvenient; as doubtless most bee-keepers would do, if they once tried to do without them.

Artificial Heat!—What numerous and costly experiments have I not conducted in this direction, extending over many years? It is both a destructive and a helpful process. Hurtful if applied before warm weather is really near at

hand; greatly beneficial if used in a proper manner, only after the bees have once hatched plenty of young.

Greenhouses, coal stoves, paraffin stoves and lamps; all these have I brought into requisition, and in the light of past results all are condemned.

A joyous sight though it was to an enthusiast to stand in Summer heat at mid-Winter and watch the hundreds of busy workers at the artificial pollen, and rushing with their loads to the hives as though they made sure Summer was upon them.

But judged by the stern light of facts it remained a pleasant experiment only, for of what value were those stocks after the excessive unseasonable loss of life and consequent failure to build up when the second and real Summer approached!

And yet artificial heat gave me some of the most forward stocks I ever possessed—they were up strongly in the supers by the end of April. But it was not until March was well on the way that they were placed upon and carefully packed round with long stable manure. They did well right along, and being exempt from all outside changes, there was nothing to hinder their very rapid progress.

Condemned! Condemned!! Condemned!!!—During many years the Author has repeatedly endeavored to convince bee-keepers, both through the pages of the *British Bee Journal* and by private correspondence, that their only hope of escaping the fatal consequences of the I.O.W. disease is that of removing or otherwise using up natural stores before Winter, replacing them by efficiently medicated food.

A Word to the Wise, etc.—Many will not realize this until it is too late. They laugh at the idea of natural

stores being condemned; and yet the moment these advocates of natural stores are overtaken by the disease their apiaries are wiped out.

Wiring Foundation.—To prevent the sheet sticking to the board the Author uses nothing but cold water, wiping the wiring block over occasionally—about once for a dozen sheets.

Heating Wax Sheet *v.* Embedder.—The wax sheets are warmed by an assistant as required, in rotation, while the embedder is simply placed in a vessel of hot water between each operation, the drip shaken off before using.

Old Wax good as New.—Nothing can be more expeditious than the above plan, which the Author has always followed, and wax sheets left over from a previous season are equally as good as new when carefully warmed on each side before the fire.

Warming Foundation before Supering.—It is well not to set up foundation sheets separately in frames and sections too long before required for use; and where only a small number of hives are used, the owner cannot do better than warm each sheet immediately before supering, as the bees will then more quickly occupy and work out the foundation.

I trust that herein you have found I do not merely offer the usual and well nigh worn-out advice: "Keep your stocks strong"; but instead of then leaving you to find out for yourself how it is done, I have placed before you the definite methods that will enable you to attain the desired end.

INDEX.

INDEX TO ILLUSTRATIONS.

HALF-TONE (INSET) PLATES.

CORRECTIONS.

For "warm" cells, page 48, 7th line, read "waxen" cells.

Medicating with Izal.—The quantities given on page 116, lower paragraph, have been revised, and the correct mixture is given on page 150.

☛ Spraying to Cure. ☚

If you wish to spray **TO CURE** disease, use our special Spray-Syringe; fill once only for each operation; then spray quickly all over top bars of frames, and bees. 2s. 6d. post free.

Without fear of the result, and with no shade of hesitation, pass the nozzle to and fro, while forcing for all you are worth,—**literally driving the bees down.** Cover up quickly, closing entrance with perforated zinc for an hour. Time occupied under three minutes. To be carried out early morning, or evening when mild. Any other form of spraying is just useless and accounts for many failures.

Spray unoccupied combs and dress hives a few days before using again. Spray all over front boards and into entrances every evening.

B-WELL—the Premier Germicide—consists of Four powerful germicides in combination, while one of these prevents the usual constipation found in the I.O.W. disease. Another important item compensates for a serious deficiency found with refined sugars, making the syrup equal or superior to honey as a bee-food.

Simmins' Practically Immune Bees.

"I introduced some of your Queens during 1913 to black stocks dying away with I.O.W. disease, and now they are wonderfully strong, and one would say they are the best in the apiary."

Later:—"So far I have kept free from I.O.W. trouble, thanks to the splendid qualities of your Queens. Some of these were given to small nuclei, and gave 30lb. surplus after building up to 10 frame stocks."

Feb., 1914. A NORFOLK BEE-KEEPER.

"I have lost all my black bees—every stock except those to which I gave your W.S. Queens last autumn."

Feb., 1914. A WILTSHIRE BEE-KEEPER.

Numerous other reports are received confirming the above experiences.

W.S. Queens and Conqueror Hives.

A gratified client, who has used S.S. Hanging-chamber Hives for some 20 years, writes: "At the middle of May I deprived the W.S. stock of a comb of brood and bees to save a Black stock. At the end of May I removed another comb of brood. End of June, removed seven combs of brood and an artificial swarm. Nevertheless, I have extracted 50 lbs. and taken 35 finished sections from the original stock."

Eye, Suffolk, October, 1911. Rev. D. D. B.

From One Queen: Five Stocks and 142 lbs.

"I think they (W.S.) are the most prolific bees I have ever had. I have five stocks and 142 lbs. of honey for the season from one Queen."

Weak Foul Brood Lot Regenerated and—100 lbs.

"The second W.S. was introduced to a very weak lot affected with foul brood. Nevertheless, she built it up to a very strong colony and gave 100 lbs. In spite of the foul brood this became the strongest colony I had." L. Q.

November 9th, 1900.

W.S. versus Natives.

"Your W.S. Queens placed by the side of Natives outstripped them altogether, both in building up and gathering honey. They did splendidly." H. C.

Wigston, October 24th, 1911.

After buying a score, Must still have more and more.

"I want to start next season with all W.S. Queens. They are so much nicer to handle than Blacks, and the Queens more easily found. They cap their honey almost as white as Blacks do." H. F. S.

Etherley, September 11th, 1911.

Sudden Rise in a "Poor District."

"The Queen I got from you last year has done well this season. She gave 173 lbs. of honey; the largest take ever known in this district, which is considered a poor one." A. B.

South Boldon, October 4th, 1911.

S.S. Method of Breeding does it—190 lbs.

"The W.S. (spring stock and its increase) gave 190 lbs. in sections by weight." J. M. E.

Ussie Valley, September 5th, 1911.

First Season with Conquerors and W.S. Bees.

"Two 6-frame nuclei received May 10th. June 1st, both booming full colonies; June 20th, finishing off supers. They exceed for work anything I ever had in New Zealand. The 16-in. by 10-in. frames are none too large; should have no time for the English 'Standard.' One hive especially is a colony the like I have never seen before." J. Y.

Seven Oaks, June 20th, 1913.

Another Progressive Fact.

"In September, 1907, I gave a White Star Italian to my *weakest* stock; and in the following summer that stock gave me the largest amount of surplus, which speaks well for the W.S. strain." U. W.

Arnold, Notts, March 27th, 1909.
